Revised Study Plan

Boundary Hydroelectric Project (FERC No. 2144)

Study No. 14
Assessment of Factors Affecting Aquatic Productivity in Tributary Habitats

Seattle City Light

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TABLE OF CONTENTS

1.0 Introduction 1

2.0 Study Plan Elements 1

2.1. Nexus Between Project Operations and Effects on Resources 1
2.2. Agency Resource Management Goals 1
2.3. Study Goals and Objectives 1
2.4. Need for Study 2
2.5. Detailed Description of Study 6
2.6. Work Products 7
2.7. Consistency with Generally Accepted Scientific Practice 8
2.8. Consultation with Agencies, Tribes, and Other Stakeholders 8
2.9. Schedule 9
2.10. Progress Reports, Information Sharing, and Technical Review 10
2.11. Anticipated Level of Effort and Cost 10

3.0 Literature Cited 11

List of Tables

Table 2.9-1. Schedule for completing the Assessment of Factors Affecting Aquatic Productivity in Tributary Habitats. 9

List of Figures

Figure 2.4-1. Length of adfluvial habitat in tributary basins draining to Seven Mile, Boundary, and Box Canyon Reservoirs based upon the location of the lowermost tributary fish passage barrier. 3
Figure 2.4-2. Drainage area of tributary basins contributing to the Pend Oreille River from the mouth to Albeni Falls Dam. Sources: USGS stream gage site information at Newport, below Box Canyon Dam, and at the International Border; (Pommen Water Quality Consulting 2003). 4
Figure 2.4-3. Brook trout distribution in tributaries draining to the Boundary Reservoir. 5

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Study No. 14 – Assessment of Factors Affecting Aquatic Productivity in Tributary Habitats

1.0 INTRODUCTION

Tributary streams contribute water, nutrients, sediment, and woody debris to habitats within Boundary Reservoir portion of the mainstem Pend Oreille River. In addition to the role of tributaries in physical stream processes, tributary streams can provide a source of refuge, recruitment, and foraging to fish that inhabit Boundary Reservoir. Conversely, fish that exhibit a primarily riverine life history may use Boundary Reservoir for refuge, recruitment and foraging on a short-term basis. Fish that migrate between lakes or rivers and streams are considered to exhibit an adfluvial life history trait. Project operations can cause fluctuations in Boundary Reservoir water surface elevations, but evaluating the effects of Boundary Project (Project) operations will depend, in part, on understanding factors affecting adfluvial fish populations. For instance, the Pend Oreille River supports a mix of coldwater and warmwater, native and non-native fish species. During summer months, Pend Oreille River water temperatures up to 24ºC have been measured within the Boundary Project area (SCL 2006a). High water temperatures may cause native salmonids, such as bull trout and westslope cutthroat trout to seek cold water refugia, such as tributary streams with water temperatures less than those found in mainstem habitats.

2.0 STUDY PLAN ELEMENTS

2.1. Nexus Between Project Operations and Effects on Resources

Information on factors affecting aquatic productivity in tributary reaches is needed to evaluate the role of tributary streams in the seasonal distribution and abundance of fish, particularly native salmonids, in Boundary Reservoir. Information on the potential movement of fish between mainstem and tributary habitats will be developed as part of the Fish Distribution, Timing and Abundance Study (Attachment 2, Study No. 9 in this RSP). However, information on factors affecting aquatic productivity in tributary habitats is needed to evaluate the influence of Project operations on fish that may exhibit an adfluvial life history. In addition, information on factors affecting aquatic productivity in Boundary Reservoir tributary streams may be helpful in identifying potential measures designed to offset impacts to aquatic resources associated with Project operations.

2.2. Agency Resource Management Goals

A broad description of agency management goals is provided in the Aquatic Habitat Modeling Study (see Study No. 7, section 2.2).

2.3. Study Goals and Objectives

The goal of this study is to compile and evaluate information on Boundary Reservoir tributaries that will provide context for studies of the effects of Boundary Project operations on aquatic

resources. The objective of this study is to inventory information on physical habitats and fish in Boundary Reservoir tributaries and to evaluate factors affecting tributary productivity.

2.4. Need for Study

Summary of Existing Information

An initial review of the available information suggests that compared to the upstream Box Canyon reservoir system and the downstream Waneta and Seven Mile reservoir systems, there is relatively little adfluvial habitat available in Boundary Reservoir tributaries (Figure 2.4-1). Even in the absence of upstream migration barriers, the total drainage area of Boundary Reservoir tributaries is much less than upstream and downstream reservoir systems (Figure 2.4-2). However, fish in tributary streams may use Boundary Reservoir at some portion of their life cycle (as discussed in Study No. 9). Understanding factors affecting tributary populations may provide additional insight into understanding the relative abundance and distribution of these species within Boundary Reservoir and effects of Boundary Project operations. For instance, brook trout are non-native salmonids known to occupy many of the tributaries that drain to Boundary Reservoir (Figure 2.4-3). Brook trout have been cited as a threat to native salmonids as a result of interbreeding and competitive interactions (Andonaegui 2003). Brook trout may be suppressing native trout populations in some tributary reaches and affecting the potential distribution of native salmonids to other Boundary Project area habitats.

Need for Additional Information

Biological and physical habitat surveys of tributaries to Boundary Reservoir have been conducted by tribal, federal and state resource agencies, and data from these surveys are available as Geographic Information System (GIS) databases and as published and unpublished (gray) literature. After compiling the available information and developing an initial list of factors affecting productivity, additional site-specific field information may be needed to refine a list of factors affecting aquatic productivity and evaluate whether any of those factors can be modified through human intervention.

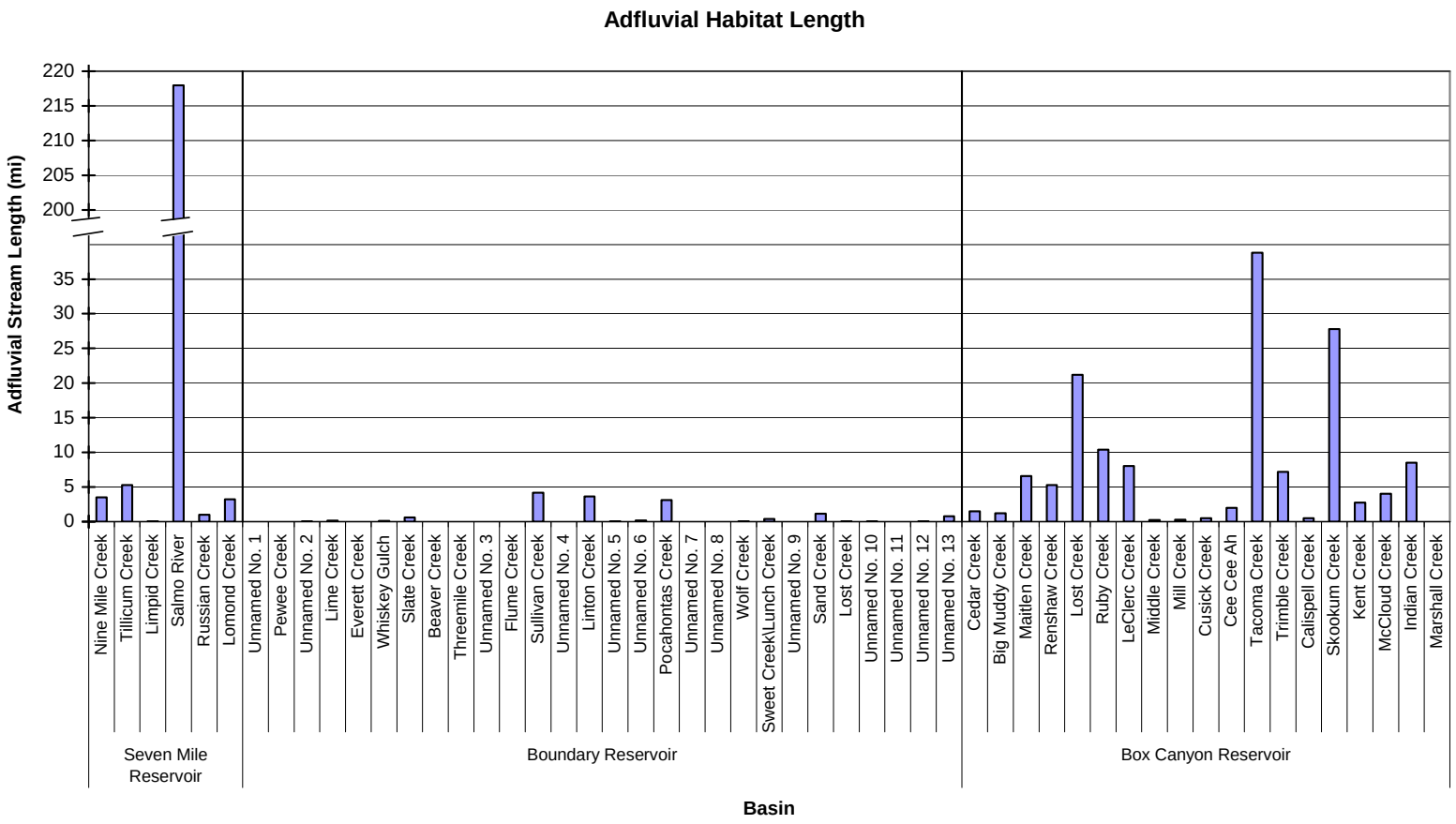


Figure 2.4-1. Length of adfluvial habitat in tributary basins draining to Seven Mile, Boundary, and Box Canyon Reservoirs based upon the location of the lowermost tributary fish passage barrier. Source of barrier information: Seven Mile Reservoir - R.L. &L and Taylor and Associates (2001), Sigma Engineering LTD (1996); Boundary Reservoir – McLellan (2001); Box Canyon Reservoir – Andonaegui (2003). For basins without specific barrier information, adfluvial habitat was assumed to be limited to average reach gradients of less than 16% based upon GIS data from BCMSRM (2001) and NWIFC and WDFW (2002).

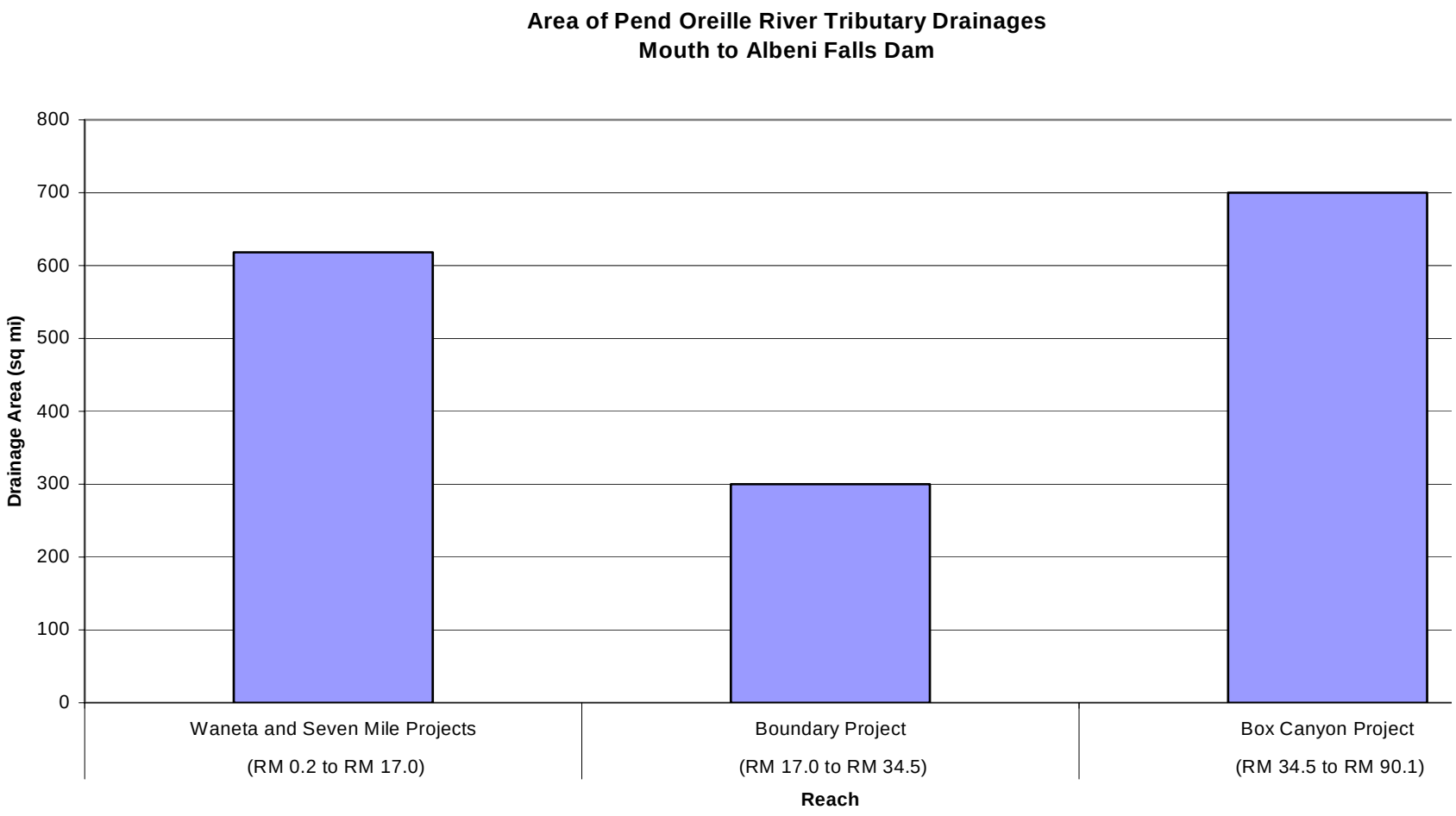
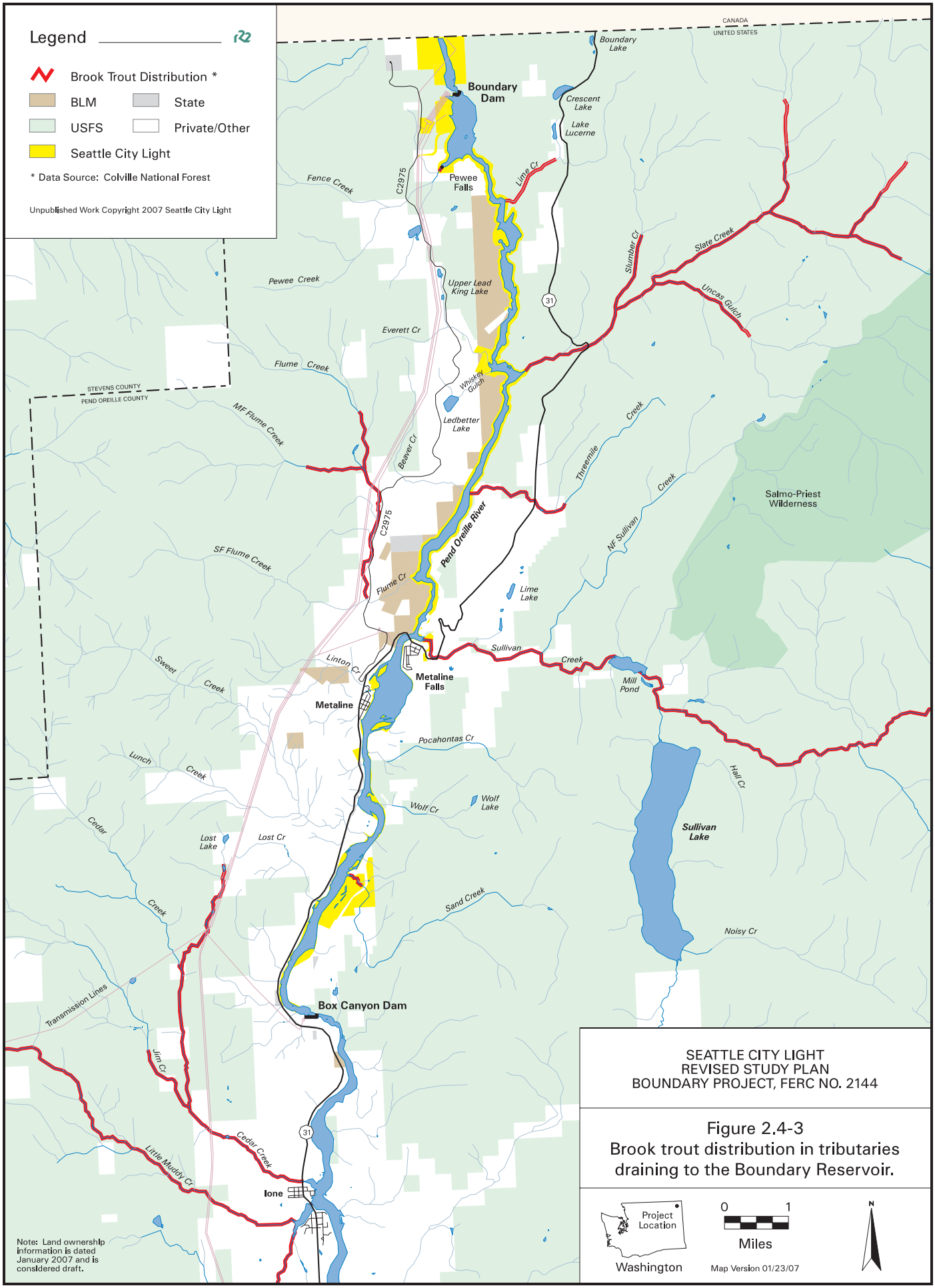


Figure 2.4-2. Drainage area of tributary basins contributing to the Pend Oreille River from the mouth to Albeni Falls Dam. Sources: USGS stream gage site information at Newport, below Box Canyon Dam, and at the International Border; (Pommen Water Quality Consulting 2003).



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BOUNDARY PROJECT, FERC NO. 2144

Figure 2.4-3
Brook trout distribution in tributaries draining to the Boundary Reservoir.

2.5. Detailed Description of Study

Study Area

The study area for this effort will consist of tributary stream streams draining to the Pend Oreille River from Box Canyon Dam downstream to Boundary Dam.

Proposed Methodology

The study effort for the Assessment of Factors Affecting Aquatic Productivity in Tributary Habitats consists of five tasks, as described below.

Task 1) Review and Compile Available Information

Available hydrology, water quality, fish habitat, fish presence and abundance, and migration barrier information for tributaries draining to Boundary Reservoir will be reviewed and compiled. The existing GIS database (USFS 2005) contains information on stream length, width, gradient, flow, water quality, riparian conditions, fine and coarse sediment sources, and road, railroad, or utility crossings. The database will be reviewed to identify data gaps or inconsistencies between data from alternate sources. Available aquatic habitat and fish distribution information for tributaries draining to Boundary Reservoir will be obtained from the following sources:

- Andonaegui (2003)
- Cascade Environmental Services (1996)
- Connor et al. (2005)
- Entrix (2001, 2002)
- McLellan (2001)
- R2 Resource Consultants (1998)
- Terrapin Environmental (2000)
- USFS (1998)
- USFS (1996)
- USFS (2005)
- Baldwin and McLellan (2005) [1]

During 2007, and 2008, additional information gathered through the field efforts associated with the Fish Distribution, Timing and Abundance Study (Study No. 9) will be added to the database.

[1] Corrected erroneous citation.

Task 2) List of Productivity Factors

Based upon a review of materials in Task 1, develop a list of factors affecting the productivity of native biota and their habitats specific to each Boundary Reservoir tributary. Types of factors to be considered might include, but not be limited to:

- instream habitat quality, such as the distribution of large woody debris, stream bank erosion;
- riparian land-use practices;
- fish migration barriers, man-made or natural;
- presence of non-native species; and/or
- native species recruitment.

Task 3) Draft Limiting Factors Matrix

Prepare a matrix of factors limiting the productivity of native species for each tributary. Criteria to be considered when developing a matrix of factors limiting productivity will be identified with relicensing participants and may include length of stream affected, existing species, water temperature, existing land-use, riparian habitats and access. This matrix will be used to assess the likelihood that factors limiting productivity in each stream can be altered.

Task 4) Identify Data Gaps

Review available information supporting the matrix developed in Task 3 and identify potential data gaps and the need for supplemental information. Determine, in consultation with relicensing participants, the need to conduct additional field surveys in select tributary reaches to fill critical data gaps. For planning purposes, we assumed additional field surveys would require two weeks of field effort for three people.

Task 5) Finalize Limiting Factors Matrix

Review the matrix of factors limiting production developed in Task 3, and in view of additional information acquired as part of this and other relicensing study efforts during 2008, develop a final matrix of factors limiting productivity in each stream. Prepare a report that describes the factors limiting productivity of native species in each tributary and an evaluation of general feasibility regarding whether those factors can be changed through human intervention.

2.6. Work Products

The work products for this study include the following:

- An electronic database containing the available information from Boundary Reservoir tributaries on hydrology, water quality, fish habitat, fish presence and abundance, channel morphology, riparian conditions, and migration barriers.
- A final matrix of factors limiting the productivity of native species in Boundary Reservoir tributaries.

- Interim and final study reports including the final matrix of limiting factors and a description of the methods and results of any field surveys conducted to fill data gaps.

2.7. Consistency with Generally Accepted Scientific Practice

Biological and physical habitat surveys of tributaries to Boundary Reservoir have been conducted by Tribal, federal and state resource agencies, and data from these surveys are available as GIS databases and as published and unpublished (gray) literature. If additional field survey information is needed to provide additional detail on a tributary reach of particular interest, field surveys will be conducted consistent with accepted techniques as described in Bain and Stevenson (1999). However, if additional information is needed to verify existing data, or to respond to gaps in data coverage, the field methods and procedures used in the original survey may be adopted to ensure data consistency.

2.8. Consultation with Agencies, Tribes, and Other Stakeholders

A draft outline of the study plan for the Assessment of Factors Affecting Aquatic Productivity in Tributary Habitats was distributed to relicensing participants prior to a Fish and Aquatic Workgroup meeting held in Spokane, Washington, on August 14, 2006. During this workgroup meeting, the outline was presented and relicensing participants provided comments. The draft study plan was developed from the outline and in response to relicensing participant comments. Comments provided by relicensing participants on the review outline for this study plan are summarized in the Proposed Study Plan (PSP) Attachment 4-1 (SCL 2006b) and can also be found in meeting summaries available on SCL's relicensing website (www.seattle.gov/light/news/issues/bndryRelic).

In its PAD/Scoping comment letter (USFWS 2006), the USFWS endorsed the Assessment of Factors Affecting Aquatic Productivity in Tributary Habitats study outline that was presented at the workgroup meetings. In the USFS's PAD/Scoping comment letter (USFS 2006), and WDFW's August 28, 2006 comment letter to SCL, the Factors Affecting Tributary Habitats outline was not specifically referenced, but the USFS indicated its interest in tributary habitats and biota in its comments on Native Salmonid Presence and Migration Study request. During a follow-up conference call on September 8, 2006, USFS staff indicated that there was general agreement on the outlines presented at the workgroup meetings. They agreed that their need for information on tributary habitats and biota would probably be met by a combination of existing information on tributary habitats and biota, the results of snorkel surveys in the lower tributary reaches, and information developed as part of this tributary habitats study.

The plan for the Assessment of Factors Affecting Aquatic Productivity in Tributary Habitats, as modified to address relicensing participant comments, was included in the PSP that was filed with FERC on October 16, 2006. Since filing the PSP, SCL has continued to work with relicensing participants on its proposed study plans. Comments made during the November 15 study plan meeting and comments filed with the FERC by the USFS (2007) and the USFWS (2007) were supportive of the proposed study. No other PSP comments were filed with FERC regarding this study. (Comments are summarized in Attachment 3 and consultation documentation is included in Attachment 4 of this RSP). As a result, SCL has made no further technical modifications to the plan for the Assessment of Factors Affecting Aquatic Productivity

in Tributary Habitats as part of this RSP. .Additional details will be developed in early 2007 when the Technical Consultant finalizes the study implementation details in coordination with SCL and relicensing participants (Attachment 1, section 2.2 of this RSP).

2.9. Schedule

The schedule for completing the Assessment of Factors Affecting Aquatic Productivity in Tributary Habitats is provided in Table 2.9-1.

Table 2.9-1. Schedule for completing the Assessment of Factors Affecting Aquatic Productivity in Tributary Habitats.

Activity	2007				2008				2009
	1 Q	2 Q	3 Q	4 Q	1 Q	2 Q	3 Q	4 Q	1 Q
Technical Consultant study refinement	-------								
Compile and review tributary, habitat, barrier, and distribution information		-------	-----						
Prepare interim study report (first-year results)				●					
Distribute interim study report					●				
Meet with relicensing participants to review first year efforts and results and discuss plans for any second year efforts					●				
Include interim study report in Initial Study Report (ISR) filed with FERC					●				
Hold ISR meeting and file meeting summary with FERC					●				
Develop an initial list of potential factors affecting the productivity of native species in tributaries				-	-----		-------		
Determine the need for additional information					-------				
Conduct field surveys, if needed						▲▲	▲		
Review and revise the list factors affecting productivity of native species in Boundary tributaries.							---------	--	
Prepare "draft" final study report								●	
Distribute "draft" final study report for relicensing participant review								●	
Meet with relicensing participants to review study efforts and results and "cross-over" study results									●
Include final study report in Updated Study Report (USR) filed with FERC									●
Hold USR meeting and file meeting summary with FERC									●

2.10. Progress Reports, Information Sharing, and Technical Review

An interim report summarizing tributary habitat conditions and describing the methods and results of 2007 efforts, an initial ranked list of factors affecting productivity specific to each Boundary tributary stream, and if necessary, a proposed list of additional information needs will be distributed in early 2008. A final study report of the Assessment of Factors Affecting Aquatic Productivity in Tributary Habitats will be distributed in early 2009. The interim and final study reports will be available to relicensing participants. Prior to release of the Initial and Updated Study Reports (which will include the results of this study), SCL will meet with relicensing participants to discuss the study results, as described in Attachment 1, section 2.3 of this RSP.

2.11. Anticipated Level of Effort and Cost

Based on a review of study costs associated with similar efforts conducted at other hydropower projects, the estimated cost to implement this effort at the Boundary Project ranges from $60,000 to $80,000; estimated study costs are subject to review and revision as additional details are developed.

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