Attachment E-8: Fish and Aquatics Management Plan

Boundary Hydroelectric Project (FERC No. 2144)

Fish and Aquatics Management Plan

Seattle City Light

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List of Acronyms and Abbreviations

Ecology	Washington Department of Ecology
EPA	US Environmental Protection Agency
FAMP	Fish and Aquatics Management Plan
FAWG	Fish and Aquatics Workgroup
fps	feet per second
HPA	Hydraulic Project Approval
I&E	interpretation and education
ILP	Integrated Licensing Process
IRA	Integrated Resource Analysis
JARPA	Joint Aquatic Resources Permit Application
LWD	large woody debris
MOU	Memorandum of Understanding
NWRU	Northeast Washington Recovery Unit
PLP	Preliminary Licensing Proposal
PM&E	protection, mitigation, and enhancement
PRM	Project river mile
PUD	Public Utility District
RRMP	Recreation Resources Management Plan
SEPA	State Environmental Policy Act
USACOE	US Army Corps of Engineers
USFS	USDA Forest Service
USFWS	U.S. Fish and Wildlife Service
WDFW	Washington Department of Fish and Wildlife

Fish and Aquatics Management Plan

Boundary Hydroelectric Project (FERC No. 2144)

1 INTRODUCTION

This Fish and Aquatics Management Plan (FAMP or plan) has been prepared to comply with articles _____ of the Federal Energy Regulatory Commission License for Seattle City Light's (SCL) Boundary Hydroelectric Project (Project) (FERC No. 2144).

SCL's License Application includes 13 protection, mitigation, and enhancement (PM&E) measures for Fish and Aquatics resources, as well as contribution to an Interpretation and Education (I&E) Program (I&E is addressed in greater detail in SCL's Recreation Resource Management Plan [RRMP], Attachment E-12 to Exhibit E of the License Application). This FAMP provides information about how SCL intends to implement the PM&E measures, conduct monitoring, report on the progress of their implementation, and provide funding for their completion. The FAMP is divided into the following four elements:

- Mainstem measures
- Tributary habitat measures
- Native trout conservation measures

Mainstem measures include providing upstream passage for native salmonids at Boundary Dam and improvements to habitat conditions in Boundary Reservoir. A variety of habitat enhancement measures will be implemented to benefit native salmonids in tributaries to Boundary Reservoir. These measures are designed to protect and enhance aquatic habitat potentially used by bull trout (*Salvelinus confluentus*), westslope cutthroat trout (*Oncorhynchus clarki lewisi*), and mountain whitefish (*Prosopium williamsoni*). The native trout conservation measures include suppression non-native competitors in select tributaries and supplementation of these streams with early life stage, locally adapted native salmonids spawned and reared in a hatchery environment. The goal of the fish community monitoring element of the FAMP is to provide federal, state, and tribal agencies with demographic and population information on fish species inhabiting the Project area, which will be critical for making informed management decisions in the future.

SCL will implement the FAMP in consultation with a Fish and Aquatics Workgroup (FAWG). The FAWG will consist of representatives from SCL and the federal, state, tribal, and local entities having jurisdiction over, or interest in, the implementation of the Project license articles. At the discretion of the FAWG, subcommittees could be created for specific issues, such as upstream passage, that draw on specialized expertise from the agencies represented on the FAWG, or other entities. The FAWG will be responsible for providing technical guidance for all license articles related to Fish and Aquatics resources, attempting to make recommendations based on reaching consensus in the group. Irresolvable differences will be resolved through a dispute resolution process identified as part of the new Project license.

2 GOALS

2.1. Mainstem Aquatic Habitat and Connectivity

As described in Section 4.5.3 of Exhibit E of the License Application, Project facilities and operations can have an adverse effect on aquatic habitat in the Project area. These effects primarily include disruption of the transport and distribution of bedload and large woody debris (LWD) and trapping and stranding of fish. In addition, habitat fragmentation has been cited as an important concern relative to the maintenance and recovery of bull trout and westslope cutthroat trout populations (69 FR 59996; USFWS 1999; Rieman and McIntyre 1993; Rieman et al. 1997; McIntyre and Rieman 1995). The available survey information reviewed by Rieman et al. (1997) and McIntyre and Rieman (1995) indicates that in most regions bull trout and westslope cutthroat trout distribution is discontinuous or patchy. Passage barriers are an isolating mechanism for local populations, and none of the hydroelectric projects on the Pend Oreille River, including the Boundary Project, currently has upstream fish passage facilities. Re-establishment of connectivity between spawning, foraging, and overwintering habitat for local populations of bull trout and the maintenance of migration corridors is an important objective of the Northeast Washington Unit (NWU) Recovery Team (USFWS 2002).

The goals of the mainstem aquatic habitat and connectivity element of the FAMP include:

- Improve management of LWD collected at Boundary Dam
- Improve salmonid habitat associated with LWD at tributary deltas
- Improve the amount of high quality mountain whitefish spawning habitat in the Box Canyon Dam tailrace
- Reduce the incidence of fish trapping in the Upper Reservoir Reach[1]
- Determine the population origin of bull trout and westslope cutthroat trout in the Boundary Dam tailrace
- Provide fish passage to allow native salmonids to pass upstream at Boundary Dam to access upstream habitats

[1] Forebay Reach - Boundary Dam to Z Canyon (PRM 17.0 – 18.0); Canyon Reach – Z Canyon to Metaline Falls (PRM 18.0 – 26.8); Upper Reservoir Reach – Metaline Falls to Box Canyon Dam (PRM 26.8 – 34.5); Tailrace Reach – Boundary Dam to Red Bird Creek confluence (PRM 13.9 – 17.0). See Exhibit E of the License Application, Section 4.1.8, for reach descriptions.

2.2. Tributary Habitat

Some effects of the Project are unavoidable, such as mortality or injury during entrainment at Boundary Dam, or cannot be fully mitigated within the reservoir. Consequently, protection and enhancement measures for aquatic habitat in tributaries to Boundary Reservoir are also proposed for implementation.

The goals of the tributary habitat element of the FAMP include:

- Improve aquatic habitat
- Improve streambank stability
- Improve riparian conditions
- Improve fish passage conditions in tributaries

2.3. Native Trout Conservation

Snorkeling surveys, electrofishing surveys, fyke net sampling, and angling conducted periodically since 1982 (TERA Consultants 1982, CES 1996, R2 Resource Consultants 1998, Terrapin 2000, McLellan 2001, SCL 2009a, 2009b) suggest there are no self-sustaining populations of bull trout in tributaries to Boundary Reservoir. However, individuals have infrequently been observed in the lower reaches of tributaries or in the reservoir near the mouths of Slate Creek, Sullivan Creek, and Sweet Creek. These surveys have documented the presence of eastern brook trout (*Salvelinus fontinalis*) in most streams draining into Boundary Reservoir, and this species has been identified as a threat to both bull trout and westslope cutthroat trout (Rieman and McIntyre 1993, McIntyre and Rieman 1995).

The goals of the tributary native trout conservation element of the FAMP include:

- Reduction in the size of brook trout populations in select reaches of tributaries to Boundary Reservoir.

- Increase in the population sizes of westslope cutthroat trout in select reaches of tributaries to Boundary Reservoir.

- Construction and operation of a small-scale hatchery facility for the production of native trout eyed eggs, fry, and fingerlings for stocking into tributaries to Boundary Reservoir.

2.4. Fish Community Monitoring

The goal of the research and monitoring element of the FAMP is to provide federal, state, and tribal agencies with demographic and population information on fish species inhabiting the Project area. The monitoring program, although it includes both mainstem and tributary elements, is addressed in Section 5.1 (i.e., Mainstem PM&E Measures) of this plan.

3 REGULATORY REFERENCE AND DEFINITIONS

Implementation of the FAMP will be conducted following regulatory guidance as identified in various federal, state, and local policy documents and permitting requirements for specific PM&E measures. Depending on the final design of the PM&E measures and implementation methods, it is anticipated that some or all of the permits described in the following sections may be required.

3.1. Federal Authority and Reference

Federal permits that may be needed to implement components to the FAMP include:

- USDA Forest Service Special Use Permit
- U.S. Army Corps of Engineers (USACOE) Section 10 and 404 Permits. This permitting is usually considered as part of the Joint Aquatic Resources Permit Application (JARPA). A Section 10 permit is needed for working in, over, or under navigable waters of the United States. A Section 404 permit is needed for dredging or filling in waters of the United States.
- National Historic Preservation Act Review. A review is necessary for any ground-disturbing activity. All cultural resource issues will be addressed by the Cultural Resources Workgroup.
- Endangered Species Act Section 7 Review. If specific projects are not covered under the broader Section 7 review conducted as part of Project relicensing, they will need review by the U.S. Fish and Wildlife Service (USFWS). This review is generally covered as part of the JARPA process.

A wide variety of documents outline federal policy for the various agencies that could be pertinent to the FAMP. Federal agency staff is responsible for understanding the policies of their respective agencies and alerting the FAWG to policies pertinent to implementing the FAMP.

3.2. Washington State Authority and Reference

State permits that may be needed to implement components of the FAMP include:

- Hydraulic Project Approval (Washington Department of Fish and Wildlife [WDFW]). The HPA permit is needed for any instream activity and is generally included in the JARPA process.
- Aquatic Use Authorization (Department of Natural Resources). This permit is triggered by use of state owned lands such as shore lands and beds of navigable waters. The Use Permit is generally included in the JARPA process, but may be required if in-water work is required as part of plan development.
- Critical Area Review and State Environmental Policy Act (SEPA). This process is usually considered as part of the JARPA. It is needed when work is considered in or

near waterways. There is no required review period; time required for permitting depends on issues identified and the amount and type of additional information that may be required. A SEPA checklist will be required if the JARPA process is not approved or if HPA is not required.

- Shoreline Substantial Development/Conditional Use Permit. The streamlined HPA process generally provides an exemption from the County Conditions Use Permit process.

Similar to federal regulations, a wide variety of documents outline state policy for the various agencies that will be members of the FAMP. State agency staff is responsible for understanding the policies of their respective agencies and alerting the FAWG to policies pertinent to implementing the FAMP.

3.3. Local Authority and Reference

County or City Regulations will also be followed, and any permits will be obtained for implementing the plan. Examples could be:

- Grading and clearing permits.
- Sensitive Area Ordinance; review occurs as part of the JARPA process.
- Pend Oreille County Shoreline Master Program; review occurs as part of the JARPA process.

3.4. Definitions

To ensure a common understanding of terms used in the FAMP, the following definitions apply:

JARPA: Joint Aquatic Resources Permit Application. This is a combined application for obtaining the following permits:

- Section 404 and Section 10 (U.S. Army Corps of Engineers)
- ESA Consultation (USFWS)
- Section 9 Bridge Permit (Coast Guard; not applicable for PM&Es)
- 401 Water Quality Certification (Washington Department of Ecology [Ecology])
- Hydraulic Project Approval (WDFW)
- Shoreline (Local Government)
- Substantial Development (Local Government)
- Conditional Use (Local Government)
- Permit Variance, Exemption, or Revision (Local Government)
- Floodplain Management (Local Government)
- Critical Areas Ordinance (Local Government)

Engineered logjam: A structure constructed of logs built within the channel or floodplain of a stream and designed according to standard engineering principles (Saldi-Caromile et al. 2004).

Key piece: A piece of LWD that is sufficiently large to be relatively stable. This size is dependent upon stream size and follows classification identified in Fox and Bolton (2007). For streams greater than 98.4 feet in width, a key piece must have an attached rootwad.

Large woody debris (LWD): Woody debris measuring at least 3.9 inches in diameter and 6.6 feet in length.

Native salmonids: Bull trout (*Salvelinus confluentus*), westslope cutthroat trout (*Oncorhynchus clarki lewisi*), and mountain whitefish (*Prosopium williamsoni*).

Relicensing participants (RPs): Collectively, the Federal (Environmental Protection Agency [EPA; through Ecology], U.S. Forest Service [USFS], USFWS), State (WDFW, Ecology), and Tribal (Kalispel Tribe) agencies that were active participants in the relicensing process.

Substrate size: Bedload substrate size classifications follow those in WDFW and Ecology (2003).

Compliance monitoring: Monitoring that is conducted to determine if a measure has been implemented according to the planned design.

Effectiveness monitoring: Monitoring that is conducted to determine if a measure is functioning as designed. A measure can be functioning properly and not achieve all biological objectives for the measure. For example, aquatic habitat can be improved, but not used by target species.

Biological monitoring: Monitoring that is conducted to obtain baseline and trend data for organisms. Examples of data include species composition, abundance, and size information collected at one or more locations and time periods.

Research monitoring: Monitoring that is conducted to answer specific scientific questions, such as validating assumptions, reducing uncertainty, or identifying relationships between physical and biological factors. Research monitoring may use the results of biological monitoring for retroactive analysis; however, research monitoring typically identifies specific hypotheses for testing prior to designing a monitoring program and collecting data.

Adaptive management: For the purposes of the FAMP, adaptive management is the periodic adjustment made to the implementation of a PM&E measure over the course of the license based on the results of monitoring or other information. The adaptive management of PM&E measures will occur in collaboration with the FAWG.

3.5. Other Relevant Articles of the License

This will be completed after reviewing final FERC license articles. For example, articles regarding aquatic vegetation management or water quality may be pertinent to the FAMP.

4 PLAN DEVELOPMENT PROCESS

4.1. Federal, State, and Tribal Coordination

The FAMP is the culmination of more than two years of discussion with federal, state, and tribal agencies and implementation of a number of studies conducted by SCL investigating physical and biological processes within the Project area and tributaries to Boundary Reservoir. Following FERC's Integrated Licensing Process (ILP), SCL developed study plans and reports that were reviewed by relicensing participants. Numerous meetings were held to discuss proposed study plans and the interim and final results of the studies. Following completion of the studies a Preliminary Licensing Proposal (PLP) was drafted by SCL, which included a set of preliminary PM&E measures. Relicensing participants prepared comments on the PLP and included proposed PM&E measures. SCL met with relicensing participants to discuss the effects of the Project as part of an Integrated Resource Analysis (IRA). Throughout the process SCL and relicensing participants have achieved a better understanding of each other's goals and objectives for the management of the Project and the aquatic community in the reservoir and its tributaries (for greater detail regarding RP consultation, see Section 3 of Exhibit E of the License Application).

4.2. Provisions for Further Development and Modification of the FAMP

SCL anticipates that some aspects of the FAMP will require further development and modification. For example, many of the PM&E measures, such as components upstream fish passage, are currently conceptual. To implement specific mitigation or enhancement projects, additional field data and planning will be needed to prepare specific designs. The FAWG will be responsible for providing guidance in the further development and modification of the FAMP and associated fish and aquatics resource PM&E measures.

5 PLAN IMPLEMENTATION

5.1. Mainstem PM&E Measures

5.1.1. Gravel Augmentation below Box Canyon Dam

5.1.1.1. Scope

SCL proposes to increase mountain whitefish spawning opportunities by augmenting gravel and small cobble by a total area of 4,500 square yards (yd^2) in the upper reservoir between Project river mile (PRM) 29.1 and Box Canyon Dam. Tentative sites have been identified at PRM 33.7 (0.8 mile below Box Canyon Dam) (Figure 5.1-1), but final site selection will be developed in coordination with the FAWG. Average depth of augmented gravel/small cobble would be 1 foot, resulting in a total augmented volume of 1,500 cubic yards (yd^3). For planning purposes, SCL assumed that 25 percent of the gravel/cobble volume (375 yd^3) will be replenished every five years. An implementation planning study developed cooperatively with the FAWG within three years following license issuance will be conducted to identify depth, velocity, and any other criteria used for final site selection. The implementation plan will also identify if boulder weirs or other structures are needed to help retain the augmented gravel at the proposed sites.

Conceptually, large boulders would be placed in horseshoe-shaped clusters (Figure 5.1-1). Implementation will occur within two years following completion of the planning phase.

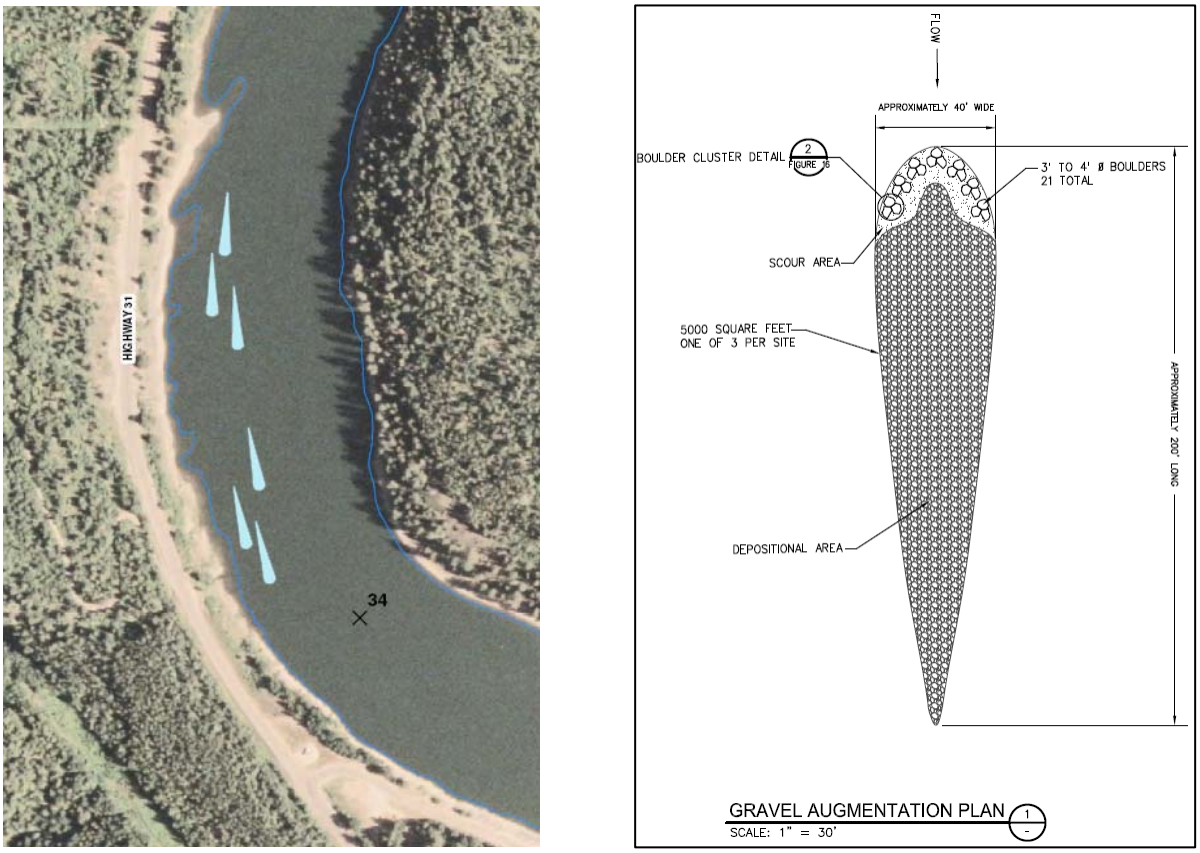

Figure 5.1-1. Tentative location of gravel augmentation near PRM 33.7 (left). Conceptual design of boulder cluster and augmented gravel (right).

5.1.1.2. Background Information

The available information from relicensing studies suggests that mountain whitefish spawn in the Box Canyon Dam tailrace. Standard monthly electrofishing surveys and targeted surveys to locate staging mountain whitefish congregations and individuals ripe for spawning were conducted between February 2007 and December 2008. In addition, egg mats were deployed at a number of locations during November 2008 and January 2009 to better understand the timing of mountain whitefish spawning. The catch of gravid and milt-flowing mountain whitefish by boat electrofishing during these surveys in the Upper Reservoir Reach generally supported the hypothesis that mountain whitefish spawn in the Upper Reservoir Reach during November and December (SCL 2009b). Furthermore, egg mats successfully collected a small number of eggs believed to be those of mountain whitefish.

A literature review provided information on mountain whitefish spawning habitat suitability criteria (i.e., depth, velocity, and substrate preferences) for use in habitat modeling; these data are pertinent to identifying potential gravel augmentation sites. Mountain whitefish spawning habitat criteria were identified in the Mainstem Aquatic Habitat Modeling Study Final Report

(SCL 2009a). Optimal depths range from 1.5 to 10.0 feet, but some spawning could also occur at depths as shallow as 0.5 feet or as deep as 30 feet. Optimal velocities range from 1.3 to 3.6 feet per second (fps), with some spawning potentially occurring at velocities as low as 0 fps and as high as 5.9 fps. Optimal substrate types are medium to large gravel and small cobbles; however, small gravel, large cobble, and boulders may also be used for spawning.

5.1.1.3. Procedures

SCL proposes to conduct an implementation planning study within three years of obtaining a new license. The specific scope of work for the study will be developed cooperatively with the FAWG. SCL envisions the objectives of the implementation planning study will be to identify:

- The specific site(s) for gravel augmentation.
- The size and amount of gravel and small cobble to be augmented.
- A specific design for boulder placement or other structures needed to help retain augmented gravel.
- The method(s) for delivering gravel to the selected site and distributing it within the augmentation area.
- The expected residence time for delivered gravel under a range of flow conditions.
- Specific monitoring protocols.

Potential sites should have depths and velocities within the habitat suitability criteria during spawning (November and December) and incubation (through January) periods for mountain whitefish. Preferably, water velocity at the potential site would also rarely exceed the critical velocity that results in transport of medium- to large-sized gravel particles, so the need to periodically replenish gravel is reduced. The existing bathymetry and distribution of substrate sizes can affect the transportability of spawning gravels. Large boulders that are currently present, or placed at the site, can help to retain spawning gravels. Potential sites should be dominated by large cobble or larger substrate sizes that can be enhanced by providing substrate within the optimal size range.

Following completion of the implementation plan and approval by the FAWG, the plan will be implemented within two years.

5.1.1.4. Compliance, Effectiveness, and Adaptive Management

Compliance monitoring will occur within one year following implementation of gravel augmentation. Protocols for collecting compliance information will be included in the implementation plan. At a minimum, compliance monitoring will include documentation collected during implementation, such as survey data, records of purchased materials (gravel, boulders, etc), and photographs of each site before and after augmentation. Compliance monitoring will also occur at five-year intervals following implementation (beginning no later than Year 9) to assess physical changes in the structures, such as the areal extent and substrate composition, and evaluate whether the measure is continuing to function as designed (i.e., the region's morphology is stable). During the year following monitoring, SCL, in collaboration

with the FAWG, will determine if gravel needs to be replenished at any of the augmentation sites. Coarse substrate grabs will also be collected to determine if fines are compromising the quality of the gravel. If monitoring suggests that sites are not functioning as planned, remediation measures will be developed in collaboration with the FAWG and implemented within one year.

Effectiveness monitoring will occur during the first two years following implementation and at five-year intervals thereafter and include deployment of spawning egg mats that will be placed in the area to collect whitefish eggs. The first two years of effectiveness monitoring is designed to help establish a baseline for comparison of future monitoring. Following the initial implementation of the gravel augmentation PM&E measure, effectiveness monitoring will inform adaptive management decisions regarding replenishment and maintenance of the site(s). If monitoring suggests an augmentation area is unstable, and requires more frequent replenishment of gravel than anticipated in the implementation plan, or the quality of the gravel substrate degrades from fine material infiltration, other options will be considered. Options evaluated by the FAWG in lieu of replenishing gravel at an existing augmentation site could be gravel cleaning, expanding the augmentation area at an alternative site by the amount that would otherwise be replenished, or diverting future gravel replenishment funds to other forms of mitigation.

5.1.1.5. Reporting and Schedule

The reporting and implementation schedule for mainstem gravel augmentation is summarized in Table 5.1-1.

Table 5.1-1. Reporting and implementation schedule for mainstem gravel augmentation.

PM&E Measure Activity	Schedule
Implementation Plan	By License Year 3
Implementation	By License Year 5
Compliance Report	By License Year 6
Initial Effectiveness Monitoring	License Year 5 and 6
PM&E Compliance and Effectiveness Monitoring	License Year 9 and every fifth year thereafter
Monitoring Report	License Year 10 and every fifth year thereafter

5.1.1.6. Consistency with Other Plans and PM&E Measures

There are no conflicts between this PM&E measure and other resource management plans. Gravel augmentation under this PM&E measure could potentially occur near the Region 10 trapping and stranding area locally known as “Cobble Sisters," where ripe or gravid mountain whitefish have been observed during relicensing surveys. A PM&E measure is planned for the Cobble Sisters area that would entail excavating pools and channels to reduce the risk of fish trapping (Section 5.1.2). The mainstem gravel augmentation PM&E measure is not inconsistent with modifying the pools and channels, but implementation plans for these two PM&E measures would have to be coordinated if the Cobble Sisters area is selected for gravel augmentation.

5.1.2. Channel Modifications of Mainstem Trapping Pools at Project RM 30.3

5.1.2.1. Scope

SCL proposes to modify four pools (totaling about 67,320 square feet) within the Cobble Sisters area of the reservoir near PRM 30.3 to reduce the risk of fish trapping (Table 5.1-2). The modifications will include excavation of a 1,800-foot channel to an elevation of 1,979 feet NAVD 88[2] to connect three of the trapping pools (Pools 10-009, 10-013, and 10-016) and using spoils from excavation to fill one of the pools (Pool 10-016) (Figure 5.1-2). The objective of this measure will be to maintain a wetted connection to mainstem flows in the constructed channel under proposed operations. The measure will reduce the current risk to fish of being trapped in pools during periods of declining reservoir water surface elevations.

Table 5.1-2. Pools proposed for modification in trapping and stranding Region 10 ("Cobble Sisters").

Pool Number	Current Outlet Elevation	Maximum Depth (ft)	Pool Area (ft^2)
10-008	1989	8.7	48,447
10-009	1990	2.4	9,702
10-013	1991	0.3	1,881
10-016	1992	0.8	7,290
Total			67,320

Figure 5.1-2. Location of trapping pools (left) and conceptual plan (right) for modification at Cobble Sisters.

5.1.2.2. Background Information

Relicensing studies during 2007 and 2008 suggested that fry and young-of-year fish may become trapped in pools during periods of declining reservoir water surface elevations and under some conditions may suffer injury or mortality during these events. While nearly all of the trapped

[2] Elevation values are in datum NAVD 88 unless otherwise noted.

fish observed during 2007 and 2008 were non-salmonids, such as suckers, perch, or smallmouth bass fry, these trapping mechanisms could also potentially adversely affect native salmonids if they are present in the trapping areas when water surface elevations decline.

During 2008, Stranding and Trapping Region 10 at PRM 30.3 along the east bank within the Upper Reservoir Reach (commonly referred to as "Cobble Sisters") was identified as an area with a high occurrence of trapping (SCL 2009a). The pools and depressions at the site are the result of aggregate mining that occurred prior to completion of the Project. The excavated depressions have persisted since construction of the Project, which suggests the area is geomorphically stable. SCL is proposing to excavate connecting channels at the Cobble Sisters because these habitats are man-made and stable.

5.1.2.3. Procedures

SCL, in collaboration with the FAWG, will prepare an implementation plan within three years following license issuance. The implementation plan will provide design specifications for the channel excavation and dispersal of spoils based on field surveys at the Cobble Sisters. The design will include drawings that specify the current and planned topography and shape of the site. The thalweg of the excavated channel will be at an elevation of 1,979 feet NAVD 88, which will result in it being wet under all but the most extreme drawdowns and thus allow fish egress to the mainstem under nearly all flow and operating conditions.

Observations during relicensing studies suggested the risk of stranding was relatively low when shoreline gradients were greater than 4 percent (SCL 2009a). Consequently, channel banks will be graded to a target gradient of at least 4 percent. Some channels may not be able to meet the target gradient because of engineering constraints that become apparent during detailed planning and a survey of the site. Excavated substrate used to fill Pool 10-0016 and placed on the existing islands and shoreline will be contoured to reduce the risk of stranding but will not preclude all stranding. The design will also be based on consideration of conditions (primarily water velocity) that would reduce the likelihood of macrophyte growth in the pools and constructed channels. Scalping the tops of islands may be one method considered for reducing back-eddies and velocity shadows conducive to settlement of fine substrate materials and growth of macrophytes.

5.1.2.4. Compliance, Effectiveness, and Adaptive Management

Compliance monitoring will occur within one year following implementation of the PM&E measure. Protocols for collecting compliance information will be included in the implementation plan. At a minimum, compliance monitoring will include documentation collected during implementation of the PM&E measure, such as survey data and photographs of each site before and after augmentation. Compliance monitoring will also occur at five-year intervals following implementation (beginning no later than Year 9) to evaluate whether the excavated channel is continuing to function as designed (i.e., the region's morphology is stable). This monitoring will include measurements of physical habitats within the region to assess the morphology of the dredged channels. During the year following the monitoring, SCL, in collaboration with the FAWG, will determine if remediation measures are needed for the excavated channel.

Although excavating a connecting channel at Cobble Sisters is anticipated to reduce the incidence of stranding and trapping, the increased stability of habitats may allow colonization by an assemblage of non-native predators. Biological monitoring (snorkeling, electrofishing, or beach seines) of the region will also occur at five-year intervals. This monitoring will be conducted following spring runoff to evaluate the distribution and abundance of fish species inhabiting the Cobble Sisters area. Monitoring will also be implemented opportunistically following planned drawdowns that dewater areas to determine the level of trapping and stranding. Biological monitoring is not anticipated to trigger additional modifications to the design of the pool and channel complex over the license duration. However, if remediation measures are necessary to maintain the design specifications, the biological information could be used to inform development of the specific remediation measures.

5.1.2.5. Reporting and Schedule

The reporting and implementation schedule for channel excavation at the Cobble Sisters is summarized in Table 5.1-3.

Table 5.1-3. Reporting and implementation schedule for channel excavation at the Cobble Sisters.

PM&E Measure Activity	Schedule
Implementation Plan	By License Year 3
Implementation	By License Year 5
Compliance Report	By License Year 6
Effectiveness Monitoring	License Year 9 and every fifth year thereafter
Monitoring Report	License Year 10 and every fifth year thereafter

5.1.2.6. Consistency with Other Plans

There are no conflicts between this PM&E measure and other resource management plans. Gravel augmentation to provide high quality mountain whitefish spawning habitat could potentially occur near the Cobble Sisters area (Section 5.1.1). The mainstem gravel augmentation PM&E measure is not inconsistent with modifying the pools and channels, but implementation plans for these two measures would have to be coordinated if the Cobble Sisters area is selected for gravel augmentation.

5.1.3. Upstream Fish Passage

5.1.3.1. Scope

SCL will develop a trap-and-haul facility that provides upstream passage for native salmonids 3.9 inches and larger, because Boundary Dam is too high (340 feet) for a traditional fish ladder facility. Because of the low abundance of native salmonids in the tailrace and the high level of uncertainty regarding the feasibility of implementing a permanent upstream passage solution, SCL is proposing a phased approach to addressing the need for upstream passage. Similar approaches have been used for the recently relicensed Clark Fork River (FERC No. 2058) and

Box Canyon (FERC No. 2042) projects. SCL intends to work collaboratively with the FAWG to implement the passage program.

Phase I will last seven years and result in the design and construction of a temporary trap-and-haul facility and biological information used to determine alternative locations and periods for deploying the temporary facility. Phase II will last five to 10 years and will consist of deploying the temporary facility at the alternative locations and periods determined from Phase I. Phase II will identify the best location(s) for deploying a permanent trap-and-haul facility. At any time between Year 5 and Year 10 of Phase II, SCL, in collaboration with the FAWG, could transition to Phase III. Phase III will be the design and installation of a permanent trap-and-haul facility at a fixed location or a long-term mobile trap-and-haul facility that could be deployed on a seasonal basis and operated at various locations.

5.1.3.2. Background Information

Boundary Dam prevents upstream movement of fish, including native salmonids. However, relicensing studies indicate that the abundance of native salmonids in the Boundary Tailrace Reach is very low, representing about 2 percent of the fish community. From March 2007 to December 2008, 29 native salmonids (three bull trout [a fourth bull trout was detected via radio telemetry in 2008], 12 westslope cutthroat, and 23 mountain whitefish) were captured during monthly electrofishing and gillnet sampling in the Boundary Dam tailrace or observed while snorkeling. In comparison, 662 non-native salmonids (lake trout, brook trout, kokanee, brown trout, and triploid rainbow trout) were captured in the tailrace or observed while snorkeling. Based on genetics testing, one of the three captured bull trout was from the Salmo River and two were from tributaries to Lake Pend Oreille (the fourth bull trout, detected via radio telemetry, was from the Salmo River). Genetics analysis of five cutthroat trout indicated that three of the cutthroat trout were from the Sweet Creek/Lunch Creek watershed, one was from the Slate Creek watershed, and the source of one of them could not be identified. The origin of the captured mountain whitefish is unknown; however, several radio-tagged mountain whitefish tagged in Boundary Reservoir were later observed in Seven Mile Reservoir. In addition to the known native and non-native salmonids, 37 rainbow trout were collected in the tailrace or observed while snorkeling. These may have been native redband rainbow trout based on physical characteristics, but these tentative field identifications could not be confirmed through genetic analysis. Taken together, the available information suggests that the number of native salmonids prevented from accessing habitat upstream of Boundary Dam or contributing to the upstream gene pool is relatively small. However, the significance of these few fish, in terms of contributing to population viability, is uncertain because source population sizes for some of the native salmonid species are poorly understood. In addition, the contribution of other factors–such as tributary habitat conditions, passage at other dams, survival during peak summer temperatures, predation by exotic species, angler harvest or incidental take–on survival rates and the potential to contribute to overall population fitness is also poorly understood.

Most upstream passage facilities for salmonids are designed based on an understanding of fish physiology and behavior (Clay 1995). Because of the low numbers of native salmonids captured or observed in the Boundary Dam tailrace, there is little direct information from within the Project area about the seasonal movements of bull trout, cutthroat trout, or mountain whitefish, and there is substantial uncertainty regarding the best potential location(s) for an effective trap-

and-haul facility and whether the optimal location will change on a seasonal basis. Furthermore, the available information is limited from other nearby areas or only available for surrogate species. General life history information suggests that, if present, juvenile fish of these species would likely enter Boundary Reservoir during spring (Wydoski and Whitney 2003). It is also believed that downstream movements are affected by spring freshets (SCL 2009b). During the high spring flow of 2008, fish species typically found in upstream reservoirs were more commonly found in downstream locations compared to what occurred during the more typical spring flows of 2007. For example, walleye and largemouth bass typical of Box Canyon Reservoir were more frequently observed in Boundary Reservoir during 2008 than in 2007. Similarly, triploid trout released in Boundary Reservoir were more commonly observed in the Boundary Dam tailrace during 2008 than 2007 although similar numbers of triploid trout were released each year.

During the summer, observations of bull trout near Albeni Falls Dam (Geist et al. 2004, DuPont and Horner 2003), cutthroat trout, mountain whitefish, and triploid rainbow trout in Boundary Reservoir (SCL 2009b), and brown trout in Box Canyon Reservoir (Garrett and Bennett 1995) suggest that salmonids use thermal refugia when mainstem river temperatures begin to exceed 18 ˚C. Bull trout were captured and observed via snorkeling below Albeni Falls near a culvert that provided a thermal refuge (Geist et al. 2004). Geist et al. (2004) reported at the time of capture that river temperatures ranged from 18.0 to 23.1˚C, while the plume created by flow from the culvert ranged from 11.8 to 15.0 ˚C, depending on the day and depth.

Bull trout may begin upstream spawning migrations during the summer (Baxter 2002), but spawning migrations occur in the fall for mountain whitefish and spring for cutthroat trout. Scholz et al. (2005) noted that in many areas (e.g., Lake Pend Oreille tributaries and the Priest River and its tributaries) bull trout spawning migrations begin as early as May or June to take advantage of higher flows when entering small spawning tributaries that may have intermittent flow at their mouths later in the year. Post-spawning migrations of bull trout to over-wintering sites were completed by the end of November in the Salmo River, but these fish did not utilize Seven Mile Reservoir (Baxter 2001). All six bull trout tagged after spawning in the East River, a tributary to Priest River, migrated down the Priest River then migrated upstream in the Pend Oreille River to overwinter in either the river or Lake Pend Orielle (DuPont et al. 2007). Three of the six bull trout returned to the East River by July 1 of the following year for spawning. DuPont et al. (2007) suggested many bull trout from the East River display an allacustrine behavior pattern, meaning that spawning areas are in the outlets to lacustrine (lake) rearing areas. The behavior pattern observed by DuPont et al. (2007) is a unique form of allacustrine behavior because both downstream and upstream movements are needed between rearing and spawning areas. Garrett and Bennett (1995) observed that half the brown trout they tracked returned to Box Canyon Reservoir to overwinter following spawning in October, while the other half overwintered in their spawning tributaries. The results of a radio tracking-study suggest that brown trout exhibit very little movement during the winter (Duke Engineering & Services 2001).

Upstream movement to the tailrace of Boundary Dam does not necessarily indicate the dam is disrupting spawning behavior or success. For example, the highest catch (seven individuals) of mountain whitefish in the Boundary Dam tailrace occurred during November 2007, however no spawning activity was observed during this period or the following month (SCL 2009b). It is

believed that pre-spawning mountain whitefish stage in the Boundary Dam tailrace then move downstream to suitable spawning areas in Seven Mile Reservoir. Consequently, there is some uncertainty about the motivation for mountain whitefish movement into the tailrace and whether it would be desirable to move such fish above Boundary Dam.

5.1.3.3. Procedures

SCL envisions that the design and construction of the temporary facility will occur five to seven years following issuance of the new license. During this period SCL will implement traditional trapping methods (e.g., fyke net) at various places in the tailrace to help determine appropriate locations for deploying the temporary trap-and-haul facility and to refine the periods when it should be deployed and how many native salmonids might be captured. Difficulty in identifying a location for a trap that has the potential for capturing a significant number of native salmonids may lead the FAWG to delay or suspend the upstream fish passage program. All planning components will be conducted in consultation with the FAWG.

Phase I will involve a seven-year initiation study. The details of the study will be determined in collaboration with the FAWG during the first two years following issuance of the new license. The objectives of Phase I will be to:

- Conduct biological monitoring to determine alternative facility locations and periods of operation.
- Develop protocols for the handling and disposition of captured fish.
- Research recent developments and implementation of trap-and-haul facilities under similar hydraulic, river channel, and operational constraints.
- Conduct any necessary field measurements and surveying.
- Develop a high resolution hydraulic model for the reach where a passage facility might be installed.
- Develop design criteria.
- Develop conceptual and final temporary trap-and-haul facility designs.
- Construct the temporary facility.
- Develop protocols for deploying and retrieving the temporary facility.

Biological monitoring will include monthly traditional fish sampling methods such as electrofishing and snorkeling. Tissue samples will be taken from all captured bull trout and cutthroat trout for genetic analysis and population assignment. Fyke nets will also be considered for use, but may have low effectiveness. Fyke nets deployed for a total of 327 hours in the tailrace during 2007 (monthly May through November) and 2008 (April, July through September) were relatively ineffective (SCL 2009b). A total of seven fish were captured in the Boundary Tailrace using fyke nets, all of them centrarchids.

Biological monitoring during Phase I will also include placement of radio tags in up to 30 native salmonids captured in the tailrace each year. Tags will be distributed evenly among the three target salmonid species: bull trout, cutthroat trout, and mountain whitefish. However, if it becomes apparent that target numbers of each species will not be captured, tags will be

distributed based on the availability of the three target species. Tracking will be conducted using fixed receiving stations located only in the tailrace.

Phase II would last from Year 8 through Year 17. During Phase II the temporary trap will be deployed in a systematic fashion at the alternative locations identified during Phase I. The objective of Phase II will be to confirm locations where a permanent trap-and-haul facility would be effective for capturing native salmonids and test any attraction techniques that could be implemented such as water flow/velocity or coldwater plumes. Biological monitoring would continue during Phase II at locations not being fished by the trap-and-haul facility, but at a lower level of effort than Phase I. Biological monitoring would help to verify whether catch rates of native salmonids at the temporary facility are reasonable.

During the last two years of Phase II (Years 16 and 17), SCL and the FAWG will utilize the available information to select one of the following options for Phase III:

- Design and implement a permanent trap-and-haul facility at a fixed location.
- Design and implement a trap-and-haul facility that can be seasonally deployed and used at a variety of locations in the Boundary Dam tailrace.
- Use manual capture methods (e.g. fyke nets, electrofishing, hook and line, etc.) on a seasonal basis.
- If upstream fish passage is infeasible or impractical from engineering or biological standpoints, funds committed to implementing a trap-and-haul facility will be used to develop and implement alternative mitigation.

The last option identified above is included because the results of biological or physical studies and evaluation of a temporary trap could indicate that the effectiveness of the available capture methods is likely to be extremely low or that risk of mortality from handling, transportation, and release is too high. Based on the FAWG's decision, a Phase III Implementation Plan will be prepared to guide ongoing activities during Phase III.

5.1.3.4. Compliance, Effectiveness, and Adaptive Management

Compliance monitoring will occur as part of each phase of the upstream passage program. For Phase I, compliance will be documented in annual reports describing the activities relating to upstream passage that were completed during the year and identify any variances from the study plan. Variances will be discussed with the FAWG as well as any needed modifications to the plan for the following year. Overall compliance will also be documented in the Phase I completion report. For Phase II, compliance monitoring will be documented in a construction completion report for the temporary trap, annual reports, and the Phase II completion report. For Phase III, compliance monitoring will be documented in a construction completion report for the permanent trap (if constructed) annual reports, and five-year status reports.

Effectiveness monitoring will include annual reporting of the number of native salmonids captured, transported, and released from the trap and their disposition at the time of release. It will also include documentation of trap operations including tailrace flow levels, attraction flow levels, trap location, and hours of operation. The trap will be considered to be functioning

effectively if it is operating within the physical design specifications. A variety of factors can affect the number of fish captured by a trap, such as the number of fish in the vicinity of the trap and their level of motivation for upstream movement, that are unrelated to trap capture efficiency. Variability in the numbers of fish captured could be quite high given the low numbers of native salmonids currently present in the tailrace. Consequently, the number of native salmonids captured could be an unreliable metric for evaluating trap effectiveness.

5.1.3.5. Reporting and Schedule

The reporting and implementation schedule for the upstream passage program is summarized in Table 5.1-4.

Table 5.1-4. Reporting and implementation schedule for the upstream passage program.

PM&E Measure Activity	Schedule
Implementation Plan	By License Year 2
Phase I Monitoring	Annually License Year 2 through Year 7
Annual Reporting	Beginning Year 3
Phase I Completion Report	By License Year 7
Temporary Trap Design	By License Year 7
Temporary Trap Construction Completion Report	By License Year 8
Phase II Monitoring	Annually, License Year 8 through Year 17
Phase II Completion Report	By License Year 16
Phase III Implementation Plan	By License Year 16
Phase III Construction Completion Report	By License Year 18
Phase III Monitoring	Annually beginning License Year 18
Phase III Status Report	License Year 20 and every fifth year thereafter

5.1.3.6. Consistency with Other Plans

There are no conflicts between this PM&E measure and other resource management plans prepared for the Project.

5.1.4. Mainstem Large Woody Debris at Tributary Deltas

5.1.4.1. Scope

SCL will enhance tributary delta habitat by providing additional cover for salmonids through placement of engineered LWD jams in the upper delta regions of four tributaries to Boundary Reservoir: Sullivan, Sweet, Slate, and Linton creeks. Sullivan Creek will receive two LWD jams, and Sweet, Slate, and Linton creeks will each get one LWD jam. Each LWD jam in Slate Creek, Sweet Creek, and Linton Creek will have a target volume of 529 cubic feet (1 key piece and 5 large pieces). The target size of the LWD jams in the Sullivan Creek delta will be 1,800 cubic feet. Each LWD jam will include at least one key piece based on sizes recommended in Fox and Bolton (2007), at least one piece with an attached root wad that could also count as the

key piece, and additional LWD pieces to meet the target volume for the LWD jam. LWD jam designs will follow the engineering guidance provided in WDFW (2003) and Saldi-Caromile et al. (2004).

SCL also proposes that LWD collected at the intake trash rack at Boundary Dam be managed to retain and stockpile wood suitable for implementing this PM&E measure, as well as stream enhancement measures to be implemented in the channelized portions of Sullivan Creek and Sweet Creek. Wood to be stockpiled will be a minimum of 12 inches in diameter and 17 feet in length (medium-size categories in Peck et al. 2003).

5.1.4.2. Background Information

Relicensing studies indicate that native and non-native salmonids use tributary deltas during summer to take advantage of coldwater refugia (SCL 2009b). Deltas also serve as transition areas between the reservoir and tributary and must be used by fish moving between these two habitat types. Habitat studies indicated that there are scarce amounts of LWD (e.g., Figure 5.1-3) or other forms of cover in these tributary delta habitats (SCL 2008).

Figure 5.1-3. Downstream view of Sweet Creek in the upper delta area (left) and looking upstream at Sullivan Creek during early September 2007.

The Large Woody Debris Management Study also examined the size and amount of woody debris removed at the Boundary Dam trash rack (SCL 2008). The number of pieces and volume of wood removed at the dam can vary widely from year to year depending on LWD recruitment to the reservoir from sources upstream and flow during spring runoff. During the 2007 and 2008 collection periods, 29 pieces and 76 pieces of wood, respectively, collected at the trash rack met the minimum size requirements for stockpiling.

5.1.4.3. Procedures

SCL proposes to conduct an implementation planning study within three years of obtaining a new license. The specific scope of work for the study will be developed cooperatively with the FAWG. SCL envisions the objectives of the implementation planning study will be to identify:

- The location and protocol for LWD stockpiling
- Specific locations for LWD jams at selected deltas
- LWD jam design specifications for each location
- Specific monitoring protocols

SCL proposes to designate an area near Boundary Dam, within the Project boundary, for stockpiling LWD removed at the dam. The location will be selected cooperatively with Boundary Dam operations staff to ensure that it will not interfere with management activities or other potential uses of the site. The target size of the site will be sufficient to stockpile approximately 10,000 cubic feet of LWD (approximately 34 logging truck loads). It is unlikely that sufficient sizes and numbers of LWD pieces can be collected at Boundary Dam over the near term to provide all the LWD needed for PM&E measures. Consequently, purchase of LWD from outside sources will likely be needed. A spreadsheet database will be maintained that includes the number of LWD pieces, by length category (17 to 50 feet, greater than 50 feet) and diameter (12 to 24 inches, 24 to 32 inches, > 32 inches) size classes, and indicate whether a root wad is attached. The database will be used to track when wood is added to or removed from the stockpile. LWD enhancement projects to be implemented by SCL will have priority use for stockpiled wood, but SCL will consider requests from other entities for use of surplus LWD.

The implementation plan will identify LWD jam locations and specifications. Possible locations of LWD jams are depicted in Figures 5.1-4 and 5.1-5. Final selection of target tributaries and design of LWD placement will be developed during post-licensing implementation planning and collaboration with the FAWG. Orientation and construction of the LWD will be tailored to each individual site, will be based on the specific hydraulic conditions of each location, and follow WDFW guidelines (WDFW 2003, Saldi-Caromile et al. 2004. Logjams will be built at a high enough elevation to minimize their use by potential non-salmonid predators at typical summer flow levels. Specific details will be developed as part of implementation planning, but SCL proposes to construct the five engineered structures within five years of license issuance. If permitting, landowner permission, or other issues prevent implementation within five years after license issuance, SCL will determine, in collaboration with the FAWG, alternate locations for installing LWD jams or allocate the funding to other PM&E measures.

Figure 5.1-4. Possible areas for LWD placement in the upper deltas of Sullivan (left) and Linton (right) creeks.

Figure 5.1-5. Possible areas for LWD placement in the upper deltas of Sweet (left) and Slate (right) creeks.

Activities at the Sullivan Creek delta associated with this PM&E measure could be affected by activities required pursuant to the pending surrender proceeding of the license for the Pend Oreille County Public Utility District's (PUD) Sullivan Lake Hydroelectric Project (FERC No. 2555), which includes Mill Pond Dam. If Mill Pond Dam is removed, it could adversely affect the effectiveness of any existing downstream enhancement projects through short- or long-term changes in sediment supply and LWD recruitment and transport. Consequently, implementation of this measure in Sullivan Creek will not occur until the disposition of Mill Pond Dam has been determined.

The design-life for structures is anticipated to be five to 10 years. Consequently, SCL assumes that maintenance or replacement structures will be needed every seven years, or up to six full replacements during the new license term for each structure. All LWD structures will be appropriately anchored through the use of pilings, boulder ballast, and cabling, or other methods to prevent transport of the large wood. Wood could be derived from the Project LWD stockpile, from the USFS, or commercial sources. Priority will be given to logs with attached root wads, but final selection will depend on the site-specific project plan and wood availability.

5.1.4.4. Compliance, Effectiveness, and Adaptive Management

Compliance monitoring will occur within one year following implementation of the LWD PM&E measure. Protocols for collecting compliance information will be included in the implementation plan. At a minimum, compliance monitoring will include documentation collected during implementation of the PM&E measure, such as survey data, records of purchased materials (LWD pieces, ballast, etc), and photographs of each site before and after LWD jam placement. Compliance monitoring will also occur at five-year intervals to evaluate the condition of structures and will include a count of the number, size, and condition of the wood pieces in each jam as well as photos. The main purpose of the compliance monitoring will be to determine if the structure needs replacement or repair.

Effectiveness monitoring will occur every five years following implementation and will include evaluation of habitat conditions in the immediate vicinity of the structure and snorkel surveys to count and identify fish species adjacent to the structure. The results of the effectiveness monitoring will be used to support adaptive management and adjustments to the PM&E measure at five-year intervals. Evaluation of habitat conditions and fish use adjacent to the structures will be available to the FAWG as supplemental information when considering alternatives to replacing or repairing a structure. For example, if a jam was being used predominately by non-native predatory fish rather than salmonids, instead of replacing or supplementing a jam near the end of its life-span at the same location, the FAWG could elect to place an equivalent-sized new logjam in a different location or different stream delta.

5.1.4.5. Reporting and Schedule

The reporting and implementation schedule for mainstem large woody debris at tributary deltas is summarized in Table 5.1-5.

Table 5.1-5. Reporting and implementation schedule for mainstem LWD placement at tributary deltas.

PM&E Measure Activity	**Schedule**
Implementation Plan	By License Year 3
Implementation	By License Year 5
Compliance Report	By License Year 6
Compliance and Effectiveness Monitoring	5year intervals following implementation
Monitoring Report	License Year 10 and every fifth year thereafter

5.1.4.6. Consistency with Other Plans

There are no conflicts between this PM&E measure and other resource management plans. LWD jam placement under this PM&E measure should be coordinated with LWD jam placement in Lower Sullivan Creek RM 0.00 to 0.54 (Section 5.2.1). As described above, implementation of this component in Sullivan Creek will not occur until the disposition of Mill Pond Dam has been determined pursuant to the pending surrender proceeding of the license for the Sullivan Lake Hydroelectric Project.

5.1.5. Fish Community Monitoring

5.1.5.1. Scope

SCL will conduct fish community surveys in Boundary Reservoir, Boundary Dam tailrace, and select tributaries at a five-year interval to obtain information on trends in the abundance and species composition of the fish community. Information for Boundary Reservoir will be collected for each of the three major reaches: Forebay, Canyon, and Upper Reservoir. Tributaries to be surveyed include Slate Creek, Flume Creek, Sullivan Creek, Sweet Creek, Linton Creek, and Sand Creek. SCL anticipates the level of effort and techniques used will be similar to those of McLellan (2001) so that trend data will be comparable across years. At a minimum, the techniques to be used include electrofishing, gill netting, and snorkeling.

5.1.5.2. Background Information

Trend information for fish communities in the Project area is important for resource management agencies so they can identify any necessary changes in management direction. One example of how trend information could be useful relates to the apparent establishment of a northern pike population in Boundary Reservoir. During 2000, McLellan (2001) observed no northern pike in the reservoir, but during relicensing studies conducted in 2007 and 2008 both adult and juvenile northern pike were observed in areas considered suitable for their spawning. Although northern pike numbers in Boundary Reservoir are considered to be relatively low, a self-reproducing population has been established, and there is the potential for increasing numbers in the future. If substantial increases in the abundance of introduced predator fish occur in the Project area, they could become a threat to the already uncommon native salmonids. Trend information could help management agencies in the development of strategies for the recovery of native salmonids and the setting of priorities and schedules for implementing these strategies. For example, WDFW could consider changes in harvest regulations to reduce the number of northern pike. Similarly, trend information could also be helpful in the adaptive management of PM&E measures being implemented by SCL as part of the new license.

5.1.5.3. Procedures

In collaboration with the FAWG, SCL will develop a survey plan during the first year following license issuance that will guide biological monitoring during license Years 2 and 3. The first two years of biological monitoring are designed to establish a baseline for comparison of monitoring in later years. Subsequent surveys will occur on a five-year interval beginning in Year 5. During the year preceding a survey year (i.e., Years 4, 9, 14, etc.), a survey plan will be prepared under the guidance of the FAWG. In general, the survey plan during later years will be similar to previous years to maintain comparability of the results. A survey completion report will be prepared within a year following completion of the survey and will include a discussion of trends in the fish community relative to previous years.

5.1.5.4. Compliance, Effectiveness, and Adaptive Management

Compliance with this PM&E measure will be documented via the Survey Completion Reports.

5.1.5.5. Reporting and Schedule

The reporting and implementation schedule for biological monitoring is summarized in Table 5.1-6.

Table 5.1-6. Reporting and implementation schedule for fish community monitoring in the Project area.

PM&E Measure Activity	Schedule
Prepare Fish Community Survey Plan	License Year 1, Year 4 and every fifth year thereafter
Conduct Fisheries Survey	License Year 2, Year 3, Year 5 and every fifth year thereafter
Survey Completion Report	License Year 4, Year 6 and every fifth year thereafter

5.1.5.6. Consistency with Other Plans

There are no conflicts between this PM&E measure and other resource management plans prepared for the Project. Any monitoring conducted in Sweet or Slate creeks should be coordinated with monitoring conducted as part of the non-native fish suppression PM&E measure (Section 5.3.1).

5.2. Tributary Aquatic Habitat

5.2.1. Habitat Protection, Riparian Improvement, and Stream Channel Enhancement in Sullivan Creek RM 0.00 to RM 0.54

5.2.1.1. Scope

This measure has three components to be implemented between the mouth of Sullivan Creek and RM 0.54 (downstream of the Highway 31 Bridge and Sullivan Creek Hydroelectric Project boundary). Each of the following components will be described separately: habitat protection, riparian improvement, and stream channel enhancement.

5.2.1.1.1. Habitat Protection

The objective of this component is to protect up to 54.7 acres within a 300-foot buffer adjacent to Sullivan Creek from RM 0.00 to 0.54, excluding county roads and residential areas (Figure 5.2-1), through a combination of conservation easements or land acquisition. Protection measures reduce the risk of future adverse effects to existing habitat. SCL owns land adjacent to this reach of Sullivan Creek, of which 29.8 acres lie within the stream corridor or proposed buffer. A variety of state, local, and private entities own the remaining land. Protection of non-SCL lands would require willingness of other landowners to enter into conservation agreements or the sale of lands within the buffer zone. SCL proposes to place all of their ownership within the buffer into a protected status throughout the duration of the new license. SCL will also pursue conservation easements or land acquisitions, but only from willing owners within the buffer zone.

Figure 5.2-1. Sullivan Creek from RM 0.00 to 0.54 with a 300-foot buffer.

5.2.1.1.2. Riparian Improvement

The objective of this component is to implement riparian improvements along the left and right banks for up to 3,000 feet of stream to improve riparian functions (shade, potential instream LWD, and erosion control), improve riparian habitat for wildlife, and decrease the presence of invasive plant species. Activities in some sections of the PM&E reach would depend on the successful implementation of the habitat protection component for non-SCL landowners. This measure assumes that improvements will be made to approximately 60 percent of the 13.8-acre area within a 100-foot buffer on each side of the stream, resulting in improvements to approximately 8.3 acres. Current riparian conditions are variable, with some portions devoid of riparian trees or brush (i.e., very sparse), some having a moderate density of mixed brush, herbaceous plants, and hardwoods with some conifers (moderately sparse), and some having a relatively dense hardwood forest cover with some conifers (sparse). This measure assumes that approximately 3.8 acres of riparian buffer would require a high density of planting in areas with very sparse existing vegetation, 2.0 acres of riparian buffer would require a moderate density of planting interspersed among moderately sparse existing vegetation, and 2.5 acres of riparian buffer would require a low density of planting interspersed among sparse existing vegetation. Approximately 5.5 acres of riparian area are in good condition and do not need improvement. Non-native vegetation found in the PM&E reach will be removed and replaced with native vegetation. Selection of specific plants and planting locations will be determined as part of post-license planning and design work conducted in collaboration with the FAWG and following WDFW guidelines in Saldi-Caromile et al. (2004). It is anticipated that plants will be a mix of native coniferous and deciduous trees, shrubs, and herbaceous plants or ground cover. If

landowners are unwilling to grant permission to enhance riparian areas on their property, funds equivalent to what would have been expended will be allocated to other PM&E measures in collaboration with the FAWG.

5.2.1.1.3. Stream Channel Enhancement

The objective of this component will be to improve instream spawning and rearing habitat and channel conditions along 1,450 feet of stream by adding a combination of structural elements, primarily in the form of groins, barbs, porous boulder weirs, boulder clusters, and LWD. Addition of structural elements will contribute to pool formation, retention of LWD, and retention of coarse sediment suitable for salmonid spawning. Structural elements along the left bank would help stabilize the stream bank, protecting downstream property owners and decreasing bank erosion. For planning purposes, this component assumes that up to 100 boulders averaging 3 feet in diameter will be placed in the stream. LWD placement could occur in conjunction with some of the boulder placements for anchoring or increasing structure size. LWD is wood greater than 4 inches in diameter and 6.6 feet in length. Pieces of wood that do not meet both criteria are considered to be small wood. Selection of specific structural elements and their placement will be determined as part of post-licensing implementation planning and design work conducted in collaboration with the FAWG and following WDFW guidelines in Saldi-Caromile et al. (2004). As part of post-licensing planning, other types of structural elements such as buried groins along the left bank could be substituted for proposed elements.

This component proposes to supplement LWD to approximate the median key piece and total LWD densities estimated as reference conditions for the Douglas fir-Ponderosa Pine Region in Fox and Bolton (2007), which are 1.2 key pieces per 1,000 feet and 52 LWD pieces per 1,000 feet. A key LWD piece has sufficient mass to provide structural stability to a logjam (Saldi-Caromile et al. 2004). Over a 1,450-foot reach this equates to approximately two key pieces and 75 pieces of LWD. A relicensing survey of a 1,115-foot reach partially within this enhancement reach revealed an existing density of 33.8 pieces per 1,000 ft (SCL 2009b). For planning purposes, this component assumes one engineered logjam will be designed and built with a target volume of 1,800 cubic feet and will include at least one key piece (minimum volume of 344 cubic feet [Fox and Bolton 2007]), at least one piece with an attached root wad that could also count as the key piece, and additional LWD pieces to meet the target volume for the logjam. Other LWD pieces will be placed individually, grouped, or placed in conjunction with boulders to meet the target of 75 pieces of LWD in the reach (existing plus supplemented LWD).

SCL anticipates that LWD may need replenishment because of loss due to transport or degradation. Furthermore, SCL anticipates that woody debris structures such as logjams will have a five to 10 year lifespan and will occasionally need repair or replacement. LWD replenishment will occur on a five-year basis throughout the term of the license to meet minimum LWD target density. SCL proposes to replace each instream wood structure up to six times over the course of the license. Individual boulders and structures built using boulders are not expected to need replacement, but localized scour and other fluvial processes could result in the need for repair or repositioning of boulders.

If permitting difficulties or unwillingness by landowners to allow access to the stream or streambank modifications prevents implementation of this measure over portions of the reach,

funds equivalent to what would have been expended will be allocated to other PM&E measures in collaboration with the FAWG.

5.2.1.2. Background Information

Sullivan Creek is the largest tributary draining into Boundary Reservoir. Biological surveys conducted during relicensing indicated the delta region and lower reaches of Sullivan Creek are used for rearing by cutthroat trout, brown trout, and rainbow trout. It has also been identified as a location of known mountain whitefish spawning. Although few bull trout have been observed in Sullivan Creek, the lower 0.66 miles of Sullivan Creek is designated as "critical habitat" by the USFWS.

The presence of the City of Metaline Falls and existing commercial and residential development adjacent to this lower reach of Sullivan Creek suggests that there is a relatively high risk of future development compared to NFS lands farther upstream. A channel assessment from RM 0.47 to RM 0.68 was conducted during mid-July 2008. The habitat conditions in the surveyed reach were described as poor for fish migration, rearing, and overwintering. Spawning conditions are poor because appropriate sized gravel is lacking, and during high flows it is likely that any redds are scoured. The bed conditions of the reach have been influenced by suction dredge mining and the Highway 31 Bridge. The dominant habitat types were riffles and rapids. LWD was infrequent throughout the surveyed reach and primarily present above the water surface at the time of the survey, so it is only an active component of fish habitat at higher flows. LWD functions relative to channel conditions observed during the survey primarily included bank stability and small pool scour. No log jams were present during surveys conducted in July 2008. The riparian zone was composed of young (< 40 years old) mixed vegetation. Several riparian sections within the PM&E reach are currently not forested, and other sections have patches dominated by low brush and herbaceous vegetation (Figure 5.2-2).

5.2.1.3. Procedures

Within one year following license issuance SCL will formally set aside undeveloped lands it owns within 300 feet of Sullivan Creek from RM 0.00 to RM 0.54 to protect them from development in perpetuity. In addition, SCL will contact other landowners to determine their willingness to sell the portion of their parcels that fall within the buffer, enter into conservation easements, or allow habitat improvement. Any lands that are purchased will also be set aside in perpetuity.

Figure 5.2-2. Sullivan Creek downstream of Highway 31 Bridge.

Within three years following issuance of the license, SCL, in collaboration with the FAWG, will develop draft and final implementation plans for the riparian improvement and stream channel enhancement components of this PM&E measure. At a minimum, the plan will include:

- A description of any field surveys conducted and summary of results.
- A native vegetation list to be used for riparian planting.
- The target size and source(s) for riparian plants.
- Description of planting techniques and density.
- A map or aerial photo with a planting plan.
- Listing of the type, number, and location of instream structures.
- Engineering drawings of major instream structures (e.g., LWD jams, groins, boulder clusters, etc.).
- Anticipated source(s) of wood and boulders to be used.

Within two years of completing the final implementation plan, SCL will implement the activities identified in the plan. If riparian plantings or instream structures cannot be implemented because of landowner permission, permitting, or other issues, funds allocated to those elements would be reallocated to other PM&E measures in collaboration with the FAWG.

The design-life for engineered log structures and wood placed in streams is anticipated to be five to 10 years; consequently, for planning purposes it is anticipated that maintenance or replacement structures will be needed every seven years, or up to six full replacements for each structure over the term of the new license.

5.2.1.4. Compliance, Effectiveness, and Adaptive Management

Compliance monitoring will occur within one year following implementation of the PM&E measure. Protocols for collecting compliance information will be included in the implementation plan. At a minimum, compliance monitoring will include documentation collected during implementation of the PM&E measure, such as survey data, records of purchased materials (LWD pieces, ballast, etc), and photographs of each site before and after LWD jam or boulder placement or plantings. Compliance monitoring for riparian plantings will occur every year for three years to ensure that planted vegetation is surviving adequately and non-native vegetation is not colonizing planted areas. Non-native vegetation will be removed and dead plants replaced as needed during that three-year period in order to meet a minimum 80 percent survival of plantings.

As described above, the design-life for engineered log structures and wood placed in streams is anticipated to be five to 10 years. Consequently, compliance monitoring will also occur at five-year intervals following implementation and will include evaluation of the condition of large structures such as engineered logjams or boulder groins (including photos taken from standard locations), and large woody debris counts throughout the reach. The main purpose of the compliance monitoring will be to assess structure condition to determine if any structures need replacement or repair.

Effectiveness monitoring will occur at the same interval and include evaluation of habitat conditions in the immediate vicinity of placed structures and snorkel surveys to count and identify fish species adjacent to placed structures. The results of the effectiveness monitoring will be used to support adaptive management and adjustments to the PM&E measure at five year intervals. Evaluation of habitat conditions and fish use adjacent to the structure will be available to the FAWG as supplemental information when considering alternatives to replacing or repairing a structure. For example, if a logjam is being used predominately by non-native predatory fish rather than salmonids, instead of replacing or supplementing that logjam near the end of its life-span at the same location, the FAWG could elect to place an equivalent-sized new logjam in a different location.

5.2.1.5. Reporting and Schedule

The reporting and implementation schedule for protection, riparian planting, and stream channel enhancement in Sullivan Creek is summarized in Table 5.2-1.

Table 5.2-1. Reporting and implementation schedule for habitat protection, riparian improvement, and stream channel enhancement in Sullivan Creek RM 0.00 to RM 0.54.

PM&E Measure Activity	**Schedule**
Implementation Plan	By License Year 3
Implementation	By License Year 5
Compliance Report	By License Year 6
Compliance and Effectiveness Monitoring	License Year 9 and every 5th year thereafter
Monitoring Report	License Year 10 and every 5th year thereafter

5.2.1.6. Consistency with Other Plans

There are no conflicts between this and other resource plans developed by SCL. Placement of engineered logjams in the reach should be coordinated with plans for placing engineered logjams in the upper delta region of Sullivan Creek (Section 5.1.4).

5.2.2. Riparian, Streambank, and Channel Improvements in Sullivan Creek RM 2.30 to RM 3.93

5.2.2.1. Scope

This PM&E measure affects Sullivan Creek from approximately 265 feet downstream of the confluence of Sullivan Creek and North Fork Sullivan Creek to the Sullivan Creek Hydroelectric Project boundary downstream of Mill Pond Dam and is focused primarily on streambank and channel enhancement, but also includes a limited amount of riparian planting in conjunction with the streambank enhancement. The objective will be to deflect water from the right bank to the left bank in areas hydrologically connected to Sullivan Lake Road, decrease bank erosion on the right bank, provide instream structure to create pools and enhance deposition and retention of spawning gravel, decrease the channel width-to-depth ratio, and promote the riparian buffer along the right bank. Implementation of this component will not occur until the disposition of Mill Pond Dam is determined and any resulting alterations to Sullivan Creek have been implemented. As noted above, if Mill Pond Dam is removed, the effectiveness of any existing downstream enhancement projects could be adversely affected through short- or long-term changes in sediment supply and woody debris recruitment and transport.

This measure will result in the design and construction of up to seven engineered logjams. Each logjam will have a target volume of 1,100 cubic feet and include at least one key piece (minimum volume of 344 cubic feet [Fox and Bolton 2007]), at least one piece with an attached rootwad that could also count as the key piece, and additional LWD pieces to meet the target volume for the logjam. Up to 100 boulders averaging 3 feet in diameter will be placed in the stream, primarily in boulder clusters, but will also be used to anchor LWD pieces. Selection of specific structural elements and their placement will be determined as part of post-license planning and design work conducted in collaboration with the FAWG and following WDFW guidelines in Saldi-Caromile et al. (2004). As part of post-license planning other types of structural elements such as groins, barbs, or boulder weirs along the right bank could be substituted for proposed elements. Other LWD pieces will be placed individually, grouped, or be placed in conjunction with boulders to meet a target of 52 pieces of LWD per 1,000 feet of stream, averaged over the entire reach (existing plus supplemented LWD).

5.2.2.2. Background Information

Two sub-reaches within this PM&E reach, Reach 2 from RM 2.30 to 2.60 and Reach 3 from RM 2.74 to 3.02, underwent channel assessments as part of relicensing studies (Figure 5.2-3) (SCL 2009a). Habitat quality was described as low for salmonid spawning in both survey reaches, moderate for migration and rearing habitat in both survey reaches, low for overwintering habitat in Reach 2, and moderate for overwintering habitat in Reach 3. The reaches were described as being adversely impacted by the presence of Mill Pond Dam, which reduces transport into the

reach of coarse substrate and LWD, and the presence of Sullivan Lake Road along its right bank, which is hydraulically connected in several locations, limits lateral movement of the channel, and reduces riparian function (Figure 5.2-4). LWD density was 17.7 and 25.0 pieces per 1,000 feet in Reach 2 and Reach 3, respectively. No logjams were observed in Reach 2 and one logjam was observed in Reach 3. Riparian vegetation was described as a mixture of hardwoods and conifers, with the left bank having both young (< 40 years old) and mature trees (40-80 years old), while vegetation on the right bank was primarily young. Channel morphology was described as plane-bed, with few pools over about half of Reach 2 and throughout Reach 3. McLellan (2001) surveyed the reach from North Fork Sullivan Creek to Mill Pond Dam and observed low numbers of cutthroat trout (less than 1 fish/100 square meters [1,076 square feet]) and rainbow trout (1 fish/100 square meters [1,076 square feet]).

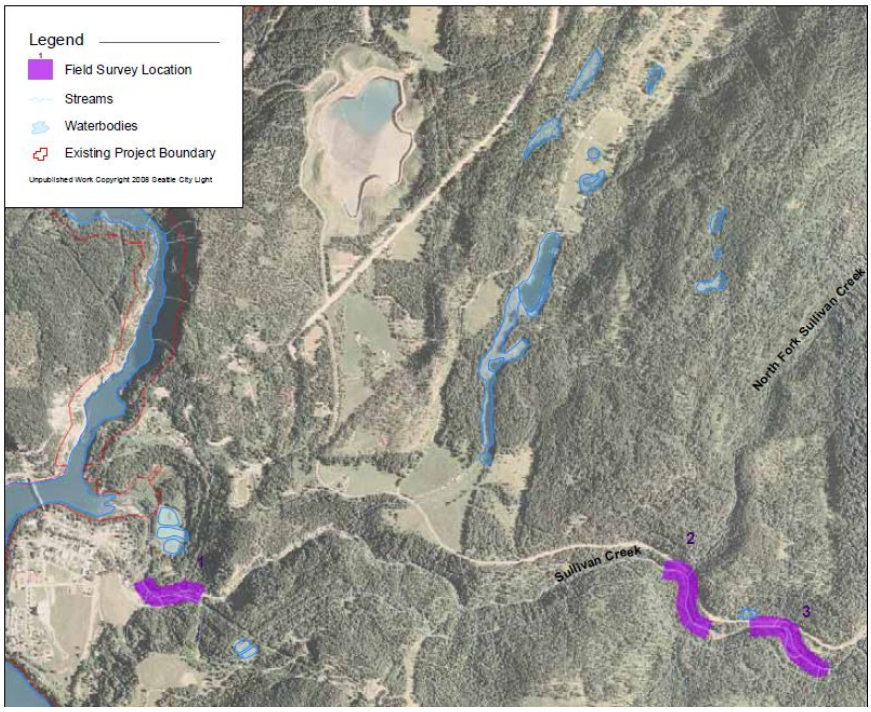

Figure 5.2-3. Reaches of Sullivan Creek surveyed during 2008.

Figure 5.2-4. Section of Sullivan Lake Road hydraulically connected to right bank of Sullivan Creek.

5.2.2.3. Procedures

Within three years following issuance of the new license, SCL will, in collaboration with the FAWG, develop a draft and final implementation plan for this PM&E measure. At a minimum, the plan will include:

- A description of any field surveys conducted and summary of results.
- A list of native plant species to be used for riparian planting.
- The target size and source(s) for riparian plants.
- Description of planting techniques and density.
- A map or aerial photo with a planting plan.
- Listing of the type, number, and location of instream structures.
- Engineering drawings of major instream structures (e.g., LWD jams, groins, boulder clusters, etc.).
- Anticipated source(s) of wood and boulders to be used.

The design-life for engineered log structures and wood placed in streams is anticipated to be five to 10 years; consequently, for planning purposes it is anticipated that maintenance or replacement structures will be needed every seven years, or up to six full replacements for each structure over the term of the new license.

Within two years following completion of the final implementation plan, SCL will implement the activities identified in the plan. If riparian plantings or instream structures cannot be

implemented because of permitting or some other issue, equivalent funding would be reallocated to other PM&E measures in collaboration with the FAWG.

5.2.2.4. Compliance, Effectiveness, and Adaptive Management

Compliance monitoring will occur within one year following implementation of the PM&E measure. Protocols for collecting compliance information will be included in the implementation plan. At a minimum, compliance monitoring will include documentation collected during implementation of the PM&E measure, such as survey data, records of purchased materials (LWD pieces, ballast, etc), and photographs of each site before and after measures are implemented. Compliance monitoring for riparian plantings will occur every year for three years to ensure that planted vegetation is surviving and non-native vegetation is not colonizing planted areas. Non-native vegetation will be removed and dead plants replaced as needed to achieve an 80 percent survival rate over those three years. As described above, the design-life for engineered log structures and wood placed in streams is anticipated to be five to 10 years. Consequently, compliance monitoring will occur at five year intervals following implementation and include evaluation of structure condition, including photos, and LWD count throughout the reach. The main purpose of the compliance monitoring and LWD counts will be to assess structure condition and LWD density to determine if any structures need replacement or repair in order to maintain their designed functions and if additional LWD placement or if replenishment is needed to meet target densities.

Effectiveness monitoring will occur at the same interval and include evaluation of habitat conditions in the immediate vicinity of the structure and snorkel surveys to count and identify fish species adjacent to the structure. The results of the effectiveness monitoring will be used to support adaptive management and adjustments to the PM&E measure at five-year intervals. Evaluation of habitat conditions and fish use adjacent to the structure could be used by the FAWG as supplemental information to consider alternatives to replacing a structure. For example, the FAWG could elect to place an equivalent-sized new log jam in a different location.

5.2.2.5. Reporting and Schedule

The reporting and implementation schedule for riparian planting and stream channel enhancement in Sullivan Creek is summarized in Table 5.2-2.

Table 5.2-2. Reporting and implementation schedule for riparian planting and stream channel enhancement in Sullivan Creek RM 2.30 to RM 3.93.

PM&E Measure Activity	**Schedule**
Implementation Plan	By License Year 3
Implementation	By License Year 5
Compliance Report	By License Year 6
Compliance Effectiveness Monitoring	License Year 9 and every fifth year thereafter
Monitoring Report	License Year 10 and every fifth year thereafter

5.2.2.6. Consistency with Other Plans

There are no conflicts between this and other resource plans developed by SCL.

5.2.3. Culvert Replacements in Slate Creek Tributaries Slumber Creek at RM 0.20 and Styx Creek at RM 0.10

5.2.3.1. Scope

Culverts at Slumber and Styx creeks (RM 0.20 and 0.10, respectively) will be replaced with new culverts that meet Washington State criteria. The primary objective of this PM&E measure is to provide passage for juvenile, sub-adult, and adult salmonid lifestages at all flows and provide access to more than 0.3 miles of resident trout habitat available in Slumber Creek and more than 1.9 miles available in Styx Creek. A secondary objective is to improve downstream transport of LWD. As part of culvert replacement, riparian planting will occur as needed in disturbed areas to control erosion and provide shade.

5.2.3.2. Background Information

Slumber Creek and Styx Creek are tributaries to Slate Creek, with their confluences at RM 2.0 and 4.9, respectively. USFS roads cross these tributaries near their mouths (RM 0.20 and 0.10, respectively). During 2008, habitat surveys were conducted upstream and downstream of these culverts for 492 feet in conjunction with evaluation of the culverts (SCL 2009a). Neither of the culverts was found to meet Washington State criteria for fish passage. The habitat survey results for Slumber Creek demonstrated that the habitat upstream of the culvert is slightly more suitable than that found downstream because the mean residual pool depth, mean thalweg depth, and volume of LWD were all greater upstream than downstream. Most notably, the volume of LWD downstream of the culvert in Slumber Creek was lower than the quantity upstream. The data from the habitat survey for Styx Creek suggested that channel complexity and water depth downstream of the culvert were greater than in the upstream section. Most of the habitat downstream and upstream of the culvert consisted of riffles. However, mean residual pool depth, mean thalweg depth, volume of LWD, and riparian structure and cover were all greater downstream of the culvert than upstream. LWD density in Styx Creek was 161 pieces per mile, which far exceeds the amount necessary to classify the LWD in this stream as properly functioning (i.e., > 20 pieces/mile) (USFWS 1998). The USFS reports that westslope cutthroat trout and eastern brook trout are present in both streams (USFS 1998).

5.2.3.3. Procedures

Within three years following issuance of the new license, SCL, in collaboration with the FAWG, will develop a draft and final implementation plan for this PM&E measure. At a minimum, the plan will include:

- A description of any field surveys conducted and summary of results.
- A list of native plant species to be used for riparian planting.
- The target size and source(s) for riparian plants, if needed.

- Engineering drawings of replacement structures.

Within two years following completion of the final implementation plan, SCL will implement the activities identified in the plan. If riparian plantings or instream structures cannot be implemented because of permitting or some other issue, SCL will allocate funds equivalent to what would have been spent to other PM&E measures in collaboration with the FAWG.

Maintenance of any replacement structures will be the responsibility of the USFS.

5.2.3.4. Compliance, Effectiveness, and Adaptive Management

Compliance monitoring will occur within one year following implementation of the PM&E measure. Protocols for collecting compliance information will be included in the implementation plan. At a minimum, compliance monitoring will include documentation collected during implementation of the PM&E measure, such as survey data, records of purchased materials (culvert, fill, geotextile cloth, etc.), and photographs of each site before and after culvert replacement. The site will be visited at least once each year for three years following implementation to inspect the viability of any planted vegetation and the presence of non-native vegetation. Non-native vegetation will be removed, and any planted vegetation that has died will be replaced as needed to achieve an 80 percent survival rate over the three years.

No effectiveness or adaptive management is included with this PM&E measure. SCL's commitment is complete when structure that meet WDFW passage criteria is in place and riparian plant monitoring and compliance associated with the structures are complete, i.e., SCL's responsibilities end after three years from the date of culvert replacement.

5.2.3.5. Reporting and Schedule

The reporting and implementation schedule for culvert replacements in Slumber and Styx creeks is summarized in Table 5.2-3.

Table 5.2-3. Reporting and implementation schedule for culvert replacements in Slumber and Styx creeks.

PM&E Measure Activity	**Schedule**
Implementation Plan	By License Year 3
Implementation	By License Year 5
Compliance Report	By License Year 6
Compliance Monitoring	Each year for 3 years following implementation

5.2.3.6. Consistency with Other Plans

There are no conflicts between this PM&E measure and other resource plans developed by SCL.

5.2.4. Riparian Planting in Linton Creek RM 0.00 to RM 0.20

5.2.4.1. Scope

Linton Creek flows through the town of Metaline and enters the reservoir at Metaline Waterfront Park. Improvement of the riparian zone along the left and right banks will be implemented for up to 655 feet of stream beginning at the mouth of Linton Creek. The objective is to improve riparian functions (e.g., shade, potential instream LWD, leaf and needle litter, erosion control, etc.), improve riparian habitat for wildlife, and decrease the presence of invasive plant species. Any non-native vegetation found in the reach within a 100-foot buffer on both sides of the stream (total area of approximately 3.0 acres) will be removed and replaced with native vegetation. Selection of specific plants and planting locations will be determined following license issuance during planning and design work conducted in collaboration with the FAWG and the City of Metaline and following WDFW guidelines in Saldi-Caromile et al. (2004). It is anticipated that vegetation to be planted will be a mix native coniferous and deciduous trees, shrubs, and herbaceous plants or ground cover. Implementation of this PM&E measure depends on permission from the City of Metaline. If permission is not obtained, the funds allocated to riparian planting along Linton Creek would be allocated to other PM&E measures in collaboration with the FAWG.

5.2.4.2. Background Information

A channel and habitat survey from RM 0.00 to 0.25 (SCL 2009a) indicated that habitat was predominantly low-gradient riffles, with an average channel slope of 2 percent (Figure 5.2-5). Riparian conditions within the survey reach were found to be poor, stream bank conditions were determined to be fair, and LWD was poor, based on the number of pieces per mile and potential recruitment sources. Pool depth and pool frequency were found to be not properly functioning, but off-channel habitat was classified as fair, due to a wetland connected to Linton Creek upstream by the culvert at RM 0.20. Thirteen culverts are present on Linton Creek, including a major stream crossing at Highway 31 at RM 0.25. Three of the culverts downstream of Highway 31 have been surveyed and two do not meet WDFW passage criteria (SCL 2009a). Results of SCL (2009b) showed that cutthroat trout, rainbow trout, brown trout, brook trout, pumpkinseed, and largescale sucker used the tributary channel from July through September 2008.

5.2.4.3. Procedures

Within three years of license issuance, SCL, in collaboration with the FAWG and the City of Metaline, will develop a draft and final implementation plan for this PM&E measure. At a minimum, the plan will include:

- A description of any field surveys conducted and summary of results.
- A list of native plant species to be used for riparian planting.
- The target size and source(s) for riparian plants.

Within two years following completion of the final implementation plan, SCL will implement the activities identified in the plan.

Figure 5.2-5. Riparian and channel conditions in lower Linton Creek.

5.2.4.4. Compliance, Effectiveness, and Adaptive Management

Preparation of a compliance report will occur within one year following implementation of the PM&E measure. Protocols for collecting compliance information will be included in the implementation plan. At a minimum, compliance monitoring will include documentation collected during implementation of the PM&E measure, such as survey data, records of purchased materials (e.g., plant numbers, size, and species; mulch; geotextile cloth, etc.), and photographs of each site before and after the riparian planting. The site will be visited at least once each year for three years following implementation to inspect the viability of any planted vegetation and the presence of non-native vegetation. Non-native vegetation will be removed and planted vegetation that has died will be replaced as needed to achieve an 80 percent survival rate over the three years.

No effectiveness monitoring or adaptive management is included with this PM&E measure. SCL's commitment to this PM&E measure will be complete once the riparian planting and three-year vegetation compliance monitoring are complete. Maintenance of the riparian buffer (e.g., pruning, removal of hazard trees) will be the responsibility of the City of Metaline.

5.2.4.5. Reporting and Schedule

The reporting and implementation schedule for riparian planting along Linton Creek is summarized in Table 5.2-4.

Table 5.2-4. Reporting and implementation schedule for riparian planting along Linton Creek RM 0.00 to RM 0.20.

PM&E Measure Activity	Schedule
Implementation Plan	By License Year 3
Implementation	By License Year 5
Compliance Report	By License Year 6
Compliance Monitoring	Each year for 3 years following implementation

5.2.4.6. Consistency with Other Plans

There are no conflicts between this and other resource plans developed by SCL. Implementation of this PM&E measure is dependent on the willingness of the City of Metaline to allow SCL to conduct the activity. If the City of Metaline is unwilling to allow the activity, funds allocated for this PM&E measure would be allocated to other mitigation measures as determined in collaboration with the FAWG.

5.2.5. Channel Improvements in Sweet Creek RM 0.40 to RM 0.50

5.2.5.1. Scope

The objective of this PM&E measure will be to increase channel complexity and gravel retention through LWD placement over a 558-foot reach downstream of the Highway 31 culvert. The bankfull width of Sweet Creek is approximately 33 feet in this reach, making it suitable for placement of channel-spanning LWD. Up to 10 channel-spanning structures will be installed. Each structure will have one to three LWD pieces, of which at least one will be a key piece with a minimum volume of 88.2 cubic feet, preferably with a rootwad attached (Fox and Bolton 2007). Selection of the specific locations and design of the spanning structures will be determined as part of post-license planning and design work conducted in collaboration with the FAWG and following WDFW guidelines in Saldi-Caromile et al. (2004). The presence of eroding stream banks will be considered during this process, and streambank reshaping could be implemented as part of structure placement to reduce erosion. As part of post-licensing planning, other types of structural elements such as partial spanning structures, porous boulder weirs, or boulder clusters could be substituted for proposed elements.

5.2.5.2. Background Information

Sweet Creek is the fourth largest tributary draining into Boundary Reservoir with a drainage area of 11.1 square miles. A series of natural falls begins at RM 0.60 that is a complete upstream passage barrier to fish. The stream also passes through a large box culvert under Highway 31 at RM 0.50. The culvert does not meet WDFW criteria for fish passage (SCL 2009a), but the presence of a bull trout observed by McLellan (2001) upstream of the culvert indicates that the culvert is passable under some conditions. Cutthroat trout, mountain whitefish, rainbow trout, brown trout, and brook trout were also observed upstream of the culvert; however, only brook trout and cutthroat trout were observed above the series of falls (McLellan 2001). Fish habitat and channel surveys conducted from the mouth to the lowermost falls suggest that riparian and

instream substrate and LWD conditions are relatively good; however, the reach is dominated by riffles and has relatively few pools (SCL 2009a; McLellan 2001). The culvert appears to block transport of LWD based on the buildup of wood and retention of gravel on the upstream side of the culvert, and streambank erosion is occurring downstream of the culvert (Figure 5.2-6) (SCL 2009a).

Figure 5.2-6. Channel conditions downstream of the Highway 31 culvert at Sweet Creek. Note the eroding left bank and lack of instream large woody debris.

5.2.5.3. Procedures

Within three years following issuance of the license, SCL in collaboration with the FAWG, will develop a draft and final implementation plan for this PM&E measures. At a minimum, the plan will include:

- A description of any field surveys conducted and summary of results.
- Listing of the type, number, and location of instream structures.
- Engineering drawings of major instream structures (e.g., drop structures, LWD jams, boulder clusters, etc.).
- Anticipated source(s) of wood and boulders to be used.

Within two years following completion of the final implementation plan, SCL will implement the activities identified in the plan. If riparian plantings or instream structures cannot be implemented because of permitting, unwillingness of landowners, or some other issue, funds allocated to those elements would allocated to other PM&E measures in collaboration with the FAWG.

The design-life for engineered log structures and wood placed in streams is anticipated to be five to 10 years; consequently, for planning purposes it is anticipated that maintenance or replacement structures will be needed every seven years during the new license term or up to six full replacements for each structure.

5.2.5.4. Compliance, Effectiveness, and Adaptive Management

Compliance monitoring will occur within one year following implementation of the PM&E measure. Protocols for collecting compliance information will be included in the implementation plan. At a minimum, compliance monitoring will include documentation collected during implementation of the PM&E measure, such as survey data, records of purchased materials (LWD pieces, ballast, etc), and photographs of each site before and after instream structures are placed. As describe above, the design-life for engineered log structures and wood placed in streams is anticipated to be five to 10 years. Consequently, compliance monitoring will also occur at five-year intervals following implementation and will include evaluation of structure condition, including photos. The main purpose of the compliance monitoring will be to assess structure condition to determine if any structures need replacement or repair.

Effectiveness monitoring will also occur at five-year intervals and include evaluation of habitat conditions in the immediate vicinity of the structure and snorkel surveys to count and identify fish species adjacent to the structure. The results of the effectiveness monitoring will be used to support adaptive management and adjustments to the PM&E measure at five-year intervals. Results from evaluation of habitat conditions and fish use adjacent to the structure will be made available to the FAWG as supplemental information when considering alternatives to replacing or repairing a structure. For example, the FAWG could elect to place an equivalent-sized new drop structure or other structural element (e.g., a logjam) in a different location.

5.2.5.5. Reporting and Schedule

The reporting and implementation schedule for channel improvements in Sweet Creek is summarized in Table 5.2-5.

Table 5.2-5. Reporting and implementation schedule for channel improvements in Sweet Creek RM 0.40 to RM 0.50.

PM&E Measure Activity	**Schedule**
Implementation Plan	By License Year 3
Implementation	By License Year 5
Compliance Report	By License Year 6
Effectiveness Monitoring	License Year 9 and every fifth year thereafter
Monitoring Report	License Year 10 and every fifth year thereafter

5.2.5.6. Consistency with Other Plans

There are no conflicts between this and other resource plans developed by SCL.

5.2.6. Riparian Buffer Protection and Enhancement of Sweet Creek RM 0.00 to RM 0.50

5.2.6.1. Scope

SCL will pursue the acquisition or protective land easements for 11.8 acres within a 100-foot buffer (excluding existing roads) on either side of Sweet Creek from the mouth to RM 0.50, which is the location of the Highway 31 culvert (Figure 5.2-7). In addition, SCL proposes to remove non-native vegetation and plant native brush and trees over 3.3 acres within that buffer. The majority of plantings would occur over a 3-acre area near the mouth of Sweet Creek where trees are mostly lacking, but would also include a 0.3-acre area north of the access road near the high school football field. Implementation of the protective portion of this PM&E measure depends on the willingness of current owners (three private owners, the Selkirk School District, Washington State Department of Natural Resources, and Washington Department of Transportation) to sell a portion of their land or enter into easement agreements. Similarly, implementing riparian plantings would require permission from the owners, even if long-term protection could not be provided. If owners are unwilling to sell or provide easements within the 100-foot buffer, then long-term protection would not be provided. If owners do not grant permission for riparian plantings, then funds equal to the cost of these plantings would be allocated to other PM&E measures as determined in collaboration with the FAWG.

Figure 5.2-7. Riparian buffer area adjacent to Sweet Creek proposed for protection.

5.2.6.2. Background Information

The coolwater plume at the tributary delta to Sweet Creek has been identified as an important area for salmonids during warm summer months. Bull trout, westslope cutthroat trout, and mountain whitefish have all been observed in the lower reaches of Sweet Creek (SCL 2009b). While most of the riparian zone of Sweet Creek downstream of Highway 31 is in relatively good condition (SCL 2009a; McLellan 2001), several areas could be improved through riparian planting, which could increase future shade and LWD recruitment potential. Protection of the existing good riparian habitat and improvement of some areas would benefit native salmonids within the stream channel and would help maintain coolwater temperatures in the tributary delta. The reach between Highway 31 and the impassable falls at RM 0.60 is currently used as an improved day use area and rest stop with paved trails.

5.2.6.3. Procedures

Within one year following license issuance SCL will contact other landowners to determine their willingness to sell the portion of their parcels that fall within the buffer, enter into conservation easements, or allow habitat improvement. Any lands that are purchased will be set-aside for protection in perpetuity.

Within three years following issuance of the license, SCL, in collaboration with the FAWG, will develop a draft and final implementation plan for the riparian improvement component of this PM&E measure. At a minimum, the plan will include:

- A description of any field surveys conducted and summary of results.
- A list of native plant species to be used for riparian planting.
- The target size and source(s) for riparian plants.
- Description of planting techniques and density.
- A map or aerial photo with a planting plan.

Within two years of completing the final implementation plan, SCL will implement the activities identified in the plan. If riparian plantings cannot be implemented because of landowner permission, permitting, or other issues, funds would be reallocated to other PM&E measures in collaboration with the FAWG.

5.2.6.4. Compliance, Effectiveness, and Adaptive Management

Preparation of a compliance report will occur within one year following implementation of the PM&E measure. Protocols for collecting compliance information will be included in the implementation plan. At a minimum, compliance monitoring will include documentation collected during implementation of the PM&E measure such as survey data, records of purchased materials (e.g., plant numbers, size, and species; mulch; geotextile cloth, etc.), and photographs of each site before and after the riparian planting. The site will be visited at least once each year for three years following implementation to inspect the viability of any planted vegetation and the presence of non-native vegetation. Non-native vegetation will be removed and planted vegetation that has died will be replaced as needed to achieve an 80 percent survival rate over the three years.

No effectiveness monitoring or adaptive management is included with this PM&E measure. SCL's commitment to this PM&E measure will be complete after the riparian planting and three-year vegetation compliance monitoring are complete.

5.2.6.5. Reporting and Schedule

The reporting and implementation schedule for riparian planting along Sweet Creek is summarized in Table 5.2-6.

Table 5.2-6. Reporting and implementation schedule for riparian buffer protection and enhancement along Sweet Creek RM 0.40 to RM 0.50.

PM&E Measure Activity	**Schedule**
Implementation Plan	By License Year 3
Implementation	By License Year 5
Compliance Report	By License Year 6
Compliance monitoring of riparian planting	Each year for 3 years following implementation

5.2.6.6. Consistency with Other Plans

There are no conflicts between this and other resource plans developed by SCL. Implementation of this PM&E measure depends on the willingness of landowners adjacent to the stream. If landowners are unwilling to sell a portion of their lands or enter into conservation easements, then no long-term protection will be provided to the riparian buffer. If landowners are unwilling to allow the riparian planting activity, funds equivalent to the riparian planting component would be allocated to other PM&E measures in collaboration with the FAWG.

5.3. Native Trout Conservation

5.3.1. Tributary Non-native Trout Suppression

5.3.1.1. Scope

SCL will conduct non-native trout suppression activities over an average of 5.8 miles of stream annually using a single-pass of backpack electrofishing equipment. The basis for this amount of stream is the assumption that suppression would occur over 2.4 miles of Sweet Creek, between the barrier falls at RM 0.92 and the fish bearing headwaters except for Lunch Creek, on a three-years-on/2-years-off cycle. Similarly, it was assumed that suppression would also occur over 7.3 miles of Slate Creek, from the barrier chutes and falls at RM 0.75 to the fish bearing headwaters, also with a single-pass of a backpack electrofishing unit and on a 3-years-on/2-years-off cycle. SCL selected these two creeks because they have barrier falls that prevent immigration of non-native fish residing downstream, westslope cutthroat trout are present at low to moderate densities, and non-native fish populations appear to be relatively small (McLellan 2001). SCL will collaborate with the FAWG on specific reach selection and the frequency of treatment.

5.3.1.2. Background Information

Most of the tributaries to the Pend Oreille River, including Boundary Reservoir, have been stocked with non-native salmonid species such as brook trout, brown trout, and rainbow trout (McLellan 2001). Within Sweet Creek, McLellan (2001) reports only one stocking event of brook trout: 1,176 fish planted in 1982, but also reported seven cutthroat trout stocking events between 1947 and 1954, but it is possible they may not have been of the westslope variety. The presence of nonnative trout, especially brook trout, has been identified as a serious threat to native salmonids as a result of interbreeding (with bull trout) and competition for habitat and food resources (Andonaegui 2003). The USFWS (1999) stated in its status review that westslope cutthroat trout are usually found in the cooler upper extents of tributaries, but suggested this use was more likely driven by competition from other trout such as rainbow trout and brook trout that are less tolerant of cooler, higher gradient streams, rather than a preference for that habitat type. Cutthroat trout, mountain whitefish, rainbow trout, brown trout, and brook trout have been observed downstream of the series of impassable falls beginning at RM 0.6; however, only brook trout and cutthroat trout were observed above the series of falls (McLellan 2001). Above the impassable series of falls (the uppermost at approximately RM 0.92), cutthroat trout densities were reported at 4 to 5 fish/100 square meters (1,076 square feet), whereas brook trout densities were about 1 fish/100 square meters (1,076 square feet). No brook trout were observed in Lunch Creek or the uppermost reach surveyed in Sweet Creek.

Slate Creek has been identified as a stream important to the recovery of bull trout in the Northwest Recovery Unit and reduction of non-native fish species as a priority action (POSRT 2005). Surveys by McLellan (2001), R2 Resource Consultants (1998), and the USFS (1998) have documented the presence of brook trout. Rainbow trout have also been documented in Slate Creek downstream of the chute and falls barrier located at RM 0.75, but it is unclear if they are native redband trout or descendents of hatchery rainbow trout stocked in the creek because no genetic tests have been conducted on rainbow trout sampled from Slate Creek. Tests of a small number of rainbow trout captured in Boundary Reservoir suggest that some had genetic characteristics similar to other native inland rainbow trout stocks, but the small sample size and lack of a baseline genetic library from nearby native redband trout populations precluded comparisons and, therefore, unequivocal conclusions (Small and Von Bargen 2009).

5.3.1.3. Procedures

Backpack electrofishing will be the technique used to capture non-native salmonids (primarily brook trout). Any other incidentally captured fish or aquatic organisms will be released unharmed near to its capture location. Details of the suppression program, including the disposition of captured non-native trout, will be determined in collaboration with the FAWG and described in an implementation plan developed within three years following issuance of a new license. Peterson et al. (2008) recommended that electrofishing suppression of brook trout involve a cycle of three consecutive years of removal followed by no more than two years of no suppression to achieve substantial benefits to cutthroat trout. Furthermore, the modeling by Peterson et al. (2008) suggested that a single pass of electrofishing was generally more cost effective than a double pass, unless habitat conditions made efficient electrofishing difficult or brook trout immigration rates were high. Consequently, the level of effort to be implemented for this PM&E measure is based on the recommendations of Peterson et al. (2008).

Conceptually, the program would treat the entire mainstem of Sweet Creek (approximately 2.4 miles, excluding Lunch Creek) upstream of RM 0.92 and short sections (no more than 300 feet) of the mouths of tributaries with suitable habitat and flow conditions by electrofishing with a single pass using a three-years-on/2-years-off cycle of suppression. Electrofishing would proceed in an upstream direction and every 328 feet (or longer if capture rates are low) captured fish would be counted, identified, and released if they are native. A block net would be placed at the end of the last segment of the day to prevent fish from immigrating from upstream before the next segment is treated. Suppression will also occur on 7.3 miles of Slate Creek, including tributaries, on the same cycle. During implementation planning, the FAWG may elect to conduct suppression on other streams, use a different on/off cycle, use multi-pass rather than single pass electrofishing, or strategically select subreaches. However, SCL is committing to no more than an average of 5.8 miles of single pass suppression per year.

The basis of the 5.8-mile average is as follows: suppression activities will be conducted for three years and then discontinued for two years over 2.4 miles of Sweet Creek and 7.3 miles of Slate Creek, for a total of 9.7 miles per year, and 29.1 miles over three years (i.e., 9.7 miles x 3 years = 29.1 miles). Annualized over the five-year on/off cycle, this will yield an average of 5.8 miles per year (29.1 miles ÷ 5 years). As stated above, SCL's commitment is an average of 5.8 miles per year, but the total could be implemented in different ways, including doing the total of 9.7

miles during three out of five years, which follows the recommendations of Peterson et al. (2008).

5.3.1.4. Compliance, Effectiveness, and Adaptive Management

Compliance will be documented in annual reports and five-year status reports. The annual reports will describe the activities relating to non-native salmonid suppression that were completed during the year and identify any variances from the study plan. The five-year status reports would include more in-depth analysis of the trends in cutthroat and brook trout abundance in the survey reaches. Variances will be discussed with the FAWG as well as any needed modifications to the plan for the following year.

Peterson et al. (2008) based their suppression model and management recommendations on demographic parameters (e.g., fecundity, age of maturity, annual survival, immigration etc.) for populations of brook and cutthroat trout they studied in headwater streams of Colorado. Because of the sensitivity of their model to these demographic parameters, they also recommended that monitoring was important for fine-tuning a suppression program. For effectiveness monitoring and adaptive management of this PM&E measure, a 328-foot segment will be delineated per mile of stream treated and designated as a monitoring reach. The distribution of the monitoring reaches and specific fish handling protocols will be determined in collaboration with the FAWG as part of post-license planning. SCL anticipates that blocking nets will be placed above and below each monitoring reach and three complete electrofishing passes will be conducted to obtain an estimate of non-native trout and cutthroat trout population size and will allow an evaluation of the effectiveness of using single versus multiple pass electrofishing under the prevalent stream conditions. Non-native trout will be removed, while cutthroat trout greater than 150 millimeters (5.9 inches) will be marked (combination of fin clip, visible implant tag, anchor tag, or PIT tag) to allow identification of groups or individuals. All non-native and cutthroat trout will be identified, weighed, and measured, and scale samples will be taken from each fish.

At the end of the initial 10 years of the suppression program, the FAWG will consider adjustments (adaptive management) to the program for the remainder of the license duration. Within the limits of the total commitment (average of 5.8 miles single pass electrofishing per year), possible adjustments could include (but are not limited to):

- Eliminating the program and diverting program funds to a different type of mitigation.
- Eliminating the program in a stream or reach and using the remaining funds for non-native trout suppression in different streams or reaches.
- Modifying the on/off cycle (e.g., to every year for 12 years, to 4 years on and 1year off for 14 years, etc.).
- Increasing the number of electrofishing passes and decreasing the number of years in which suppression would be implemented.

The number and type of potential adjustments to the program will be developed in collaboration with the FAWG during post-license planning of the suppression program. Additional

adjustments could also occur at five-year intervals based on analysis of additional data from the monitoring reaches.

5.3.1.5. Reporting and Schedule

The reporting and implementation schedule for non-native trout suppression is summarized in Table 5.3-1.

Table 5.3-1. Reporting and implementation schedule for the non-native trout suppression program.

PM&E Measure Activity	Schedule
Implementation Plan	By License Year 3
Implementation	Beginning by License Year 4
Annual Reports	Beginning by License Year 4
Effectiveness Monitoring Report	License Year 14
Five-year Status Reports	License Year 20 and every fifth year thereafter

5.3.1.6. Consistency with Other Plans

There are no conflicts between this PM&E measure and other resource management plans prepared for the Project.

5.3.2. Native Trout Supplementation Facility

5.3.2.1. Scope

SCL will fund the construction and operation of a supplementation hatchery for the production of westslope cutthroat trout and bull trout used to supplement tributaries draining into Boundary Reservoir. The initial target species would be westslope cutthroat trout, but the facility would be designed to simultaneously propagate two species of fish that could include bull trout, westslope cutthroat trout, redband trout, or mountain whitefish. The target capacity for the hatchery will be up to 45,000 eyed eggs, fry, or fingerling (3 to 4 inch) fish per year (approximately 1,000 pounds per year if all were reared to fingerling-size). Selection of species, stocks, and lifestages to be produced would be developed in coordination with the FAWG. In addition, the hatchery will have the capacity to sustain the necessary numbers of broodstock fish to produce this number of eggs, fry, or fingerlings. Because mature westslope cutthroat trout tend to be small in tributaries to Boundary Reservoir (few fish exceed 12 inches; McLellan 2001), SCL estimates broodstock requirements could be 200 to 300 fish, assuming 500 eggs per female. Assuming an average size of 2.2 pounds per fish, broodstock rearing capacity will need to be approximately 440 to 660 pounds.

For planning purposes, the propagation facility is assumed to be located at the 40-acre WDFW parcel near Indian Creek that formerly included the Usk Hatchery. WDFW currently holds a 7-cfs water right from a natural spring that could be used as a water supply. The water supply could require heating to be appropriate for some species or life stages.

5.3.2.2. Background Information

The larger tributaries to Boundary Reservoir contain a variety of fish species, and most salmonid species in the Project vicinity occur in the tributaries (SCL 2006, SCL 2009b). Surveys conducted by the USFS (2005), WDFW (McLellan 2001), and CES (1996) showed that the dominant sport fish in tributaries are westslope cutthroat trout, eastern brook trout, rainbow trout, and to a lesser extent brown trout and mountain whitefish (SCL 2006). These surveys documented observations of bull trout (1 dead individual apparently caught by an angler, and 1 observed snorkeling), kokanee, and burbot in Sullivan Creek and bull trout (1 individual) in Sweet Creek. The burbot and kokanee in Sullivan Creek were likely entrained from Sullivan Lake, where substantial sport fisheries exist for both species.

Currently, no self-reproducing bull trout populations occur in any tributaries to Boundary Reservoir. Nevertheless, the NWRU Team has identified Sullivan and Slate creeks as local bull trout populations under a recovered condition based on habitat survey data and professional judgment (USFWS 2002). The NWRU Team also suggested that artificial propagation of bull trout could be needed to seed currently unoccupied habitat, but urged caution and the need to address the threats affecting populations and their habitat before pursuing artificial propagation.

Westslope cutthroat trout are widely distributed in the Project area and tributaries to Boundary Reservoir but threatened by the presence of non-native brook trout. Suppression of brook trout in Slate and Sweet creeks is proposed as a PM&E measure. Peterson et al. (2004) found the survival of age-0 and age-1 cutthroat trout to the population at mid-elevations (approximately 8,200 to 8,858 feet elevation) were 13 times and 2 times higher, respectively, when brook trout abundance was suppressed. Lower elevations similar to the area surrounding the Boundary Project were not sampled. SCL hypothesizes that supplementation of westslope cutthroat trout in streams can complement brook trout suppression activities and result in higher recruitment to the cutthroat trout population than suppression alone.

5.3.2.3. Procedures

A multi-step approach will be used to implement this PM&E measure. Each step will occur in collaboration with the FAWG. The first step in the development of a native trout supplementation facility will be preparation of a Memorandum of Understanding (MOU) between SCL and WDFW for use of a 40-acre parcel located near Indian Creek that formerly included the Usk Hatchery. WDFW currently holds a water right for 7 cfs of spring-fed water at the site. If a mutually agreeable MOU cannot be secured, SCL will explore other options in the area that could be used to implement this PM&E measure, including expansion or modification of an existing facility. If a suitable location and water right cannot be found or other existing facility modified, SCL will allocate any remaining funds from this PM&E measure toward other PM&E measures in collaboration with the FAWG.

The second step will be preparation of an implementation plan. The implementation plan will identify the following:

- Goals and policies of federal and state agencies regarding supplementation facilities and native trout recovery.

- Risks and benefits of supplementing bull and/or westslope cutthroat trout in the Project area.
- Mitigation measures to be used to reduce risk (e.g., of spreading disease, domestication, etc.).
- A conceptual level description and engineering plan for the facility, with specifications.
- Description of any off-site facilities or techniques that could be used as part of release strategies (e.g., acclimation and volitional release ponds, streamside or instream incubation of eyed eggs, etc.).
- Sources and techniques to be used for collecting broodstock.
- Target production levels by life stage.

The third step will be preparation of draft and final engineering plans for the facility and obtaining any needed permits. The final step will be construction and operation of the facility.

5.3.2.4. Compliance, Effectiveness, and Adaptive Management

A compliance report will be prepared within one year following construction of the facility that will document any variances from the implementation plan or engineering plans. Compliance will be further documented by preparation of annual reports with the locations, numbers, species, and life stages of fish released from the facility. Annual reports will also include, at a minimum, the number of fish spawned and percent survival from egg to eyed-egg, eyed-egg to fry, and fry to release. Substantial disease outbreaks or other problems will also be reported in the annual reports, as well as remedies that were implemented to reduce the risk of problems reoccurring. Annual reports are anticipated to be brief and focused on reporting annual activities. Following construction of the facility, five-year status reports will be prepared. Status reports will summarize the annual reports and provide more detailed analysis and assessment of trends in the data. The five-year status reports will also describe any changes in production or release strategies developed in collaboration with the FAWG and the rationale for implementing the changes.

5.3.2.5. Reporting and Schedule

The reporting and implementation schedule for the native trout supplementation facility is summarized in Table 5.3-2.

Table 5.3-2. Reporting and implementation schedule for the native trout supplementation facility.

PM&E Measure/Activity	Schedule
Secure MOU with WDFW for use of Indian Creek Site or Identify Alternative Location	By end of License Year 1
Implementation Plan	By License Year 3
Facility Draft and Final Engineering Plans	By License Year 5
Facility Construction	By License Year 7
Construction Compliance Monitoring Report	By License Year 8
Annual Reports	Beginning License Year 9 and every year thereafter
Five-year Status Reports	License Year 15 and every fifth year thereafter

5.3.2.6. Consistency with Other Plans

There are no conflicts between this PM&E measure and other resource management plans prepared for the Project. Implementation and planning for this PM&E measure should consider aspects of the non-native trout suppression program described in Section 5.3.1.

5.4. Interpretation and Education Program

SCL will implement an I&E Program to provide enhanced experiences for visitors, encourage participation in multi-resource protection measures by area visitors, and promote cooperative, safe behaviors to benefit all Project area resources and visitors. The I&E Program will include media (e.g., signs, brochures, internet, etc.) provided at a variety of sites in the Project Area during the new license term. The I&E Program will be administered as an element of SCL's RRMP (Attachment E-12 to Exhibit E of the License Application).

The locations of I&E facilities and other media are critical to the success of the program. Specific sites within the Project area will be finalized based on their ability to support interpretation of the Project's identified theme, subthemes, and messages. One component of the I&E Program are subthemes relevant to fish and aquatic resources. Preliminary I&E sign/kiosk sites are identified in the RRMP, Appendix 4, concept site plans. Signs or kiosks providing information on reducing the risk of invasive species dispersal will be installed at Project boat launches at the Forebay Recreation Area and Metaline Waterfront Park. Other media such as brochures and possibly maps will be available at the Vista House, Tailrace, and Forebay recreation areas, community information centers in Metaline and Metaline Falls, and possibly at regional tourism/information centers and Scenic Byway portal sites. The design and content of the signs, including exact wording, will be finalized following issuance of the new license in consultation with the Recreation Resource Workgroup. I&E Program costs are addressed in the RRMP.

Preliminary concepts for fish and aquatic topics to be included in I&E Program are:

- Conservation of native salmonids
- Bull trout identification and protection

- Proper fish handling during catch and release angling
- Brook trout harvesting regulations in tributaries
- Minimizing the spread of non-native fish and aquatic species
- Role of Boundary Reservoir within the larger Pend Oreille River watershed

6 REPORTING, COORDINATION, AND SCHEDULE

6.1. Reporting

Each of the PM&E measures described above has reporting requirements. For the convenience of preparing and reviewing this information, a single annual report will be prepared by SCL and submitted to the FAWG. The annual report will contain subsections for each PM&E measure, with content dependent on the specific reporting requirement for the PM&E measure and the activities that occurred during the year. For example, during some years the content could include implementation plans while in others it could include the results and analysis of monitoring. The FAWG will have one month to review and provide comments on a draft annual report, and SCL will have one month to address comments and produce a final annual report for submittal to the FAWG and filing with FERC. Under some circumstances a document prepared for a PM&E measure (e.g., an upstream trap and haul facility design study) may require additional review and revision cycles that would take more time than what is available for the annual report, which will necessitate preparation on a schedule different from that of the annual report. Under these circumstances, stand-alone-reports or technical memoranda will be prepared as determined in consultation with the FAWG. A summary will be provided in the annual report, and the stand-alone report or memorandum will be provided as an appendix.

In addition to plans and reports prepared as part of individual PM&E measures, meeting summaries will be prepared for all FAWG meetings, within with action items will be identified. Follow-up memoranda will be prepared and circulated among the FAWG within one month following the meeting that identify how action items have been resolved.

6.2. Coordination

The FAWG will consisting of representatives from SCL and the federal, state, tribal, and local entities having jurisdiction over, or interest in, the implementation of fish and aquatics related Project license articles. At the discretion of the FAWG, subcommittees could be created to address specific issues, such as upstream fish passage, that draw on specialized expertise from the agencies represented on the FAWG, or other entities. The FAWG will be responsible for providing technical guidance for all license articles related to fish and aquatics resources, attempting to make recommendations based on reaching consensus in the group. Irresolvable differences will be resolved through a dispute resolution process identified as part of the new license.

6.3. Schedule

During the first 10 years following issuance of a new license it is anticipated that meetings of the FAWG would be relatively frequent because of the large number of PM&E measures to be

planned and implemented. SCL anticipates that meetings would occur every other month for the first two years and quarterly for Years 3 through 5 to report on progress made on implementation planning and implementation, and to seek direction from the FAWG. Beginning in Year 6, SCL anticipates a single, one-day annual meeting of the FAWG would be needed to report activities from the previous year and two one-day or two-day meetings every five years to discuss five-year status reports and modifications resulting from adaptive management.

7 FUNDING

This section specifies SCL's funding responsibilities. Anticipated costs for implementation of the fish and aquatics PM&E measures are provided in Table 7.0-1.

Table 7.0-1. Anticipated costs of Fish and Aquatic PM&E measures (in 2007 dollars).

	Capital		O&M			
Proposed PM&E	**Estimated Cost**	**Annualized Cost [3]**	**Annual Estimated Cost**	**Frequency**	**Annualized Cost**	**Total Annualized Cost**
• Implement a Fish and Aquatics Management Plan that encompasses all fish and aquatics-related PM&Es:	NA	NA	$168,075	Annually	$168,075	$168,075
o Reporting and consultation with the Fish and Aquatics Workgroup (FAWG)						
• Develop an upstream fish passage trap-and-haul facility:						
o Phase I monitoring	NA	NA	$280,125	Annually Years 1 through 7	$69,901	$69,901
o Phase I temporary trap-and-haul facility installation	$2,909,661	$117,417	$445,166	Annually Years 8 through 17 (O&M)	$151,687	$269,104
o Phase II temporary trap-and-haul facility monitoring	NA	NA	$93,375	Annually Years 8 through 17	$31,817	$31,817
o Phase III permanent trap-and-haul facility installation	$9,848,082	$397,411	$306,924	Annually Years 18 through 50 (O&M)	$250,172	$647,583
o Phase III permanent trap-and-haul facility monitoring	NA	NA	$46,688	Annually Years 18 through 50	$38,055	$38,055

[3] Calculation of annualized values for capital costs includes the addition of interest during construction (IDC) and overhead.

Table 7.0-1, continued…

	Capital		O&M			
Proposed PM&E	**Estimated Cost**	**Annualized Cost [3]**	**Annual Estimated Cost**	**Frequency**	**Annualized Cost**	**Total Annualized Cost**
• Implement gravel augmentation below Box Canyon Dam (initial placement and periodic replacement):	$1,024,124 (initial)	$46,287	$546,160 (replacement)	Every 5 years	$119,938	$166,225
o Compliance monitoring	NA	NA	$18,675	Every 5 years	$4,101	$4,101
o Effectiveness monitoring	NA	NA	$23,344	Every 5 years	$5,126	$5,126
• Implement channel modifications for mainstem trapping pools at Project river mile (PRM) 30.3 (initial and replacement):	$431,631 (initial)	$19,508	$43,270 (replacement / repair)	Every 10 years	$5,124	$24,633
o Compliance monitoring	NA	NA	$9,338	Every 5 years	$2,051	$2,051
o Effectiveness monitoring	NA	NA	$9,338	Every 5 years	$2,051	$2,051
• Implement placement and replacement of mainstem engineering large woody debris (LWD) at tributary deltas:	$569,247 (initial)	$25,728	$193,230 (replacement)	Every 7 years	$31,249	$56,977
o Compliance monitoring	NA	NA	$14,006	Every 5 years	$3,076	$3,076
o Effectiveness monitoring	NA	NA	$9,338	Every 5 years	$2,051	$2,051
• Boundary Reservoir fish community monitoring	NA	NA	$233,438	Every 5 years	$51,264	$51,264
• Implement habitat protection in Sullivan Creek river mile (RM) 0.00 to RM 0.54:	$428,666 (initial)	$19,374	$94,794 (replacement / repair)	Every 7 years	$15,330	$34,704
o Compliance monitoring	NA	NA	$28,013	Every 5 years	$6,152	$6,152
o Effectiveness monitoring	NA	NA	$28,013	Every 5 years	$6,152	$6,152

Table 7.0-1, continued…

	Capital		O&M			
Proposed PM&E	**Estimated Cost**	**Annualized Cost [3]**	**Annual Estimated Cost**	**Frequency**	**Annualized Cost**	**Total Annualized Cost**
• Implement LWD and riparian planting in Sullivan Creek RM 0.00 to RM 0.54:	$1,219,376	$55,112	NA	NA	NA	$55,112
o Compliance monitoring	NA	NA	$9,338	Annually Years 6 through 8	$1,130	$1,130
• Implement riparian buffer protection in Sullivan Creek RM 0.00 to RM 0.54:	$1,105,516	$49,968	NA	NA	NA	$49,968
o Compliance monitoring	NA	NA	$9,338	Year 6	$377	$377
• Implement riparian, streambank, and channel improvements in Sullivan Creek RM 2.30 to RM 3.93:	$722,237 (initial)	$32,643	$199,001 (replacement / repair)	Every 7 years	$32,182	$64,825
o Compliance monitoring	NA	NA	$46,688	Every 5 years	$10,253	$10,253
o Effectiveness monitoring	NA	NA	$46,688	Every 5 years	$10,253	$10,253
• Implement culvert replacements in Slate Creek tributaries Slumber Creek at RM 0.20 and Styx Creek at RM 0.10:	$699,048 (initial)	$31,595	$416,733 (replacement / repair)	One-time (approx. Year 40)	$16,817	$48,412
o Compliance monitoring	NA	NA	$9,338	Annually Years 6 through 8	$1,130	$1,130
• Implement riparian planting in Linton Creek RM 0.00 to 0.20:	$448,536	$20,272	NA	NA	NA	$20,272
o Compliance monitoring	NA	NA	$9,338	Annually Years 6 through 8	$1,130	$1,130

Table 7.0-1, continued…

	Capital		O&M			
Proposed PM&E	**Estimated Cost**	**Annualized Cost [3]**	**Annual Estimated Cost**	**Frequency**	**Annualized Cost**	**Total Annualized Cost**
• Implement channel improvements in Sweet Creek RM 0.40 to 0.50:	$257,902 (initial)	$11,656	$87,399 (replacement / repair)	Every 7 years	$14,134	$25,790
o Compliance monitoring	NA	NA	$28,013	Every 5 years	$6,152	$6,152
o Effectiveness monitoring	NA	NA	$28,013	Every 5 years	$6,152	$6,152
• Implement riparian planting in Sweet Creek RM 0.00 to 0.50:	$346,291	$15,651	NA	NA	NA	$15,651
o Compliance monitoring	NA	NA	$9,338	Annually Years 6 through 8	$1,130	$1,130
• Implement riparian buffer protection in Sweet Creek RM 0.00 to 0.50:	$328,680	$14,855	NA	NA	NA	$14,855
o Compliance monitoring	NA	NA	$9,338	Year 6	$377	$377
• Implement tributary non-native trout suppression:	NA	NA	$28,013	One-time (planning)	$1,130	$1,130
			$47,783	Annually (O&M)	$47,783	$47,783
o Compliance monitoring	NA	NA	$7,470	Annually	$7,470	$7,470
o Effectiveness monitoring	NA	NA	Included in O&M cost above	See above	See above	See above
• Construct a native trout supplementation facility	$7,339,281	$331,711	$429,525	Annually (O&M)	$429,525	$761,236
Fish and Aquatic Resources Total:	**$27,678,323**	**$1,189,189**	**NA**	**NA**	**$1,550,496**	**$2,739,684**

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