Lewis River Hydroelectric Projects

FERC Project Nos. 935, 2071, 2111, 2213

2011 Annual Report

Annual Summary of License Implementation and Compliance: Aquatic and Terrestrial Resources

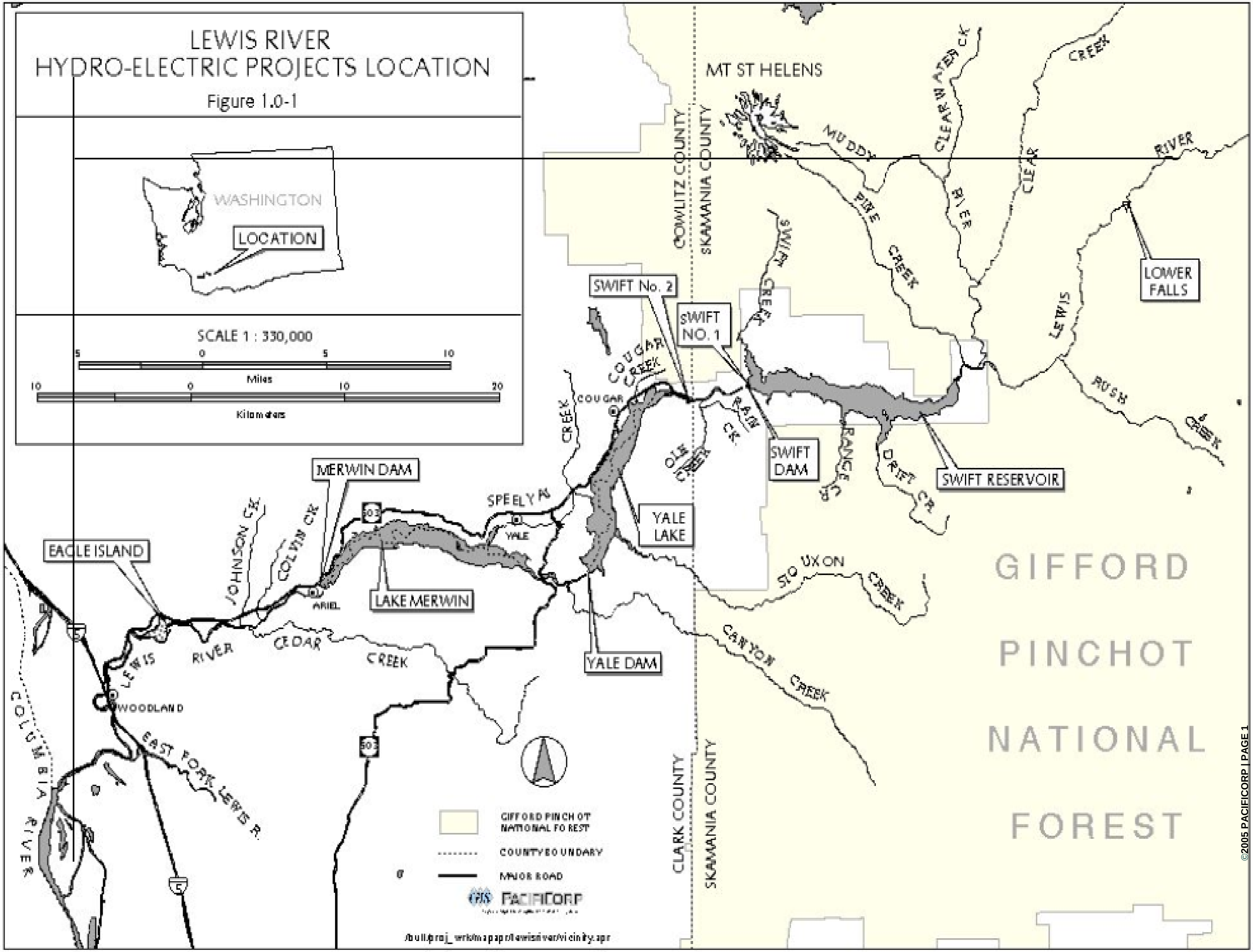
April 2012

Lewis River Hydroelectric Projects

FERC Nos. 935, 2071, 2111, 2213

Annual Summary of License Implementation and Compliance:
Aquatic and Terrestrial Resources

2011 Annual Report


LEWIS RIVER
HYDRO-ELECTRIC PROJECTS LOCATION
Figure 1.0-1
WASHINGTON
LOCATION
SCALE 1 : 330,000
Miles
Kilometers
MT ST HELENS
COWLITZ COUNTY
SKAMANIA COUNTY
CLARK COUNTY
MUDDY
CLEARWATER CK
CLEAR CREEK
RIVER
PINE CREEK
SWIFT CREEK
LEWIS
LOWER FALLS
SWIFT No. 2
SWIFT NO. 1
SWIFT DAM
SWIFT RESERVOIR
COUGAR CREEK
COUGAR
RAIN CK.
OLE CREEK
RANGE CR
DRIFT CR
RUSH CREEK
YALE LAKE
YALE DAM
YALE
SPEELYAI
SIOUXON CREEK
CANYON CREEK
MERWIN DAM
LAKE MERWIN
ARIEL
EAGLE ISLAND
JOHNSON CK
COLVIN CK
LEWIS RIVER
CEDAR CREEK
WOODLAND
EAST FORK LEWIS R
COLUMBIA RIVER
503
5
GIFFORD PINCHOT NATIONAL FOREST
COUNTY BOUNDARY
MAJOR ROAD
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GIFFORD PINCHOT NATIONAL FOREST
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1.0 INTRODUCTION

This 2011 annual report prepared by PacifiCorp Energy and the Public Utility District No. 1 of Cowlitz County, Washington ("Cowlitz PUD") is provided to the Federal Energy Regulatory Commission (FERC) and the Lewis River Settlement Agreement (SA) Parties to fulfill the reporting requirements of project licenses, articles 402 and 404, and article 14.2.6 of the agreement. It has been prepared in consultation with Terrestrial Coordination Committee (TCC) and Aquatic Coordination Committee (ACC) members. Period of record for this report is from January 1, 2011 to December 31, 2011.

To reflect the settlement Parties' interest in continuing coordination and communication of the implementation of SA and new FERC licenses, Article 14.2.6 of the SA requires PacifiCorp Energy and Cowlitz PUD to prepare annual reports describing the activities of the TCC and the ACC. This SA Article stipulates that the Committee Coordinators for the TCC and ACC shall prepare and file with the FERC detailed annual reports on the fish and wildlife Protection, Mitigation, and Enhancement (PM&E) measures occurring during the prior year as well as plans for the coming year. This annual report fulfils the requirements of Article 14.2.6.

Per the Article language, any comments that were not incorporated into this final report are presented in Attachment A of this report.

This 2011 report is available to the Public on PacifiCorp Energy's website at http://www.PacifiCorp Energy.com/es/hydro/hl/lr.html# - (License Implementation > Annual Reports). Copies of this report are available from PacifiCorp Energy.

1.1 BACKGROUND

Located on the North Fork of the Lewis River in southwestern Washington, the Lewis River Hydroelectric System consists of four operationally coordinated projects. PacifiCorp Energy owns Swift No. 1 (FERC No. 2111), Yale (FERC No. 2071), and Merwin (FERC No. 935) projects which together generate 510 MW of electricity at full capacity. Cowlitz PUD owns the 70 MW Swift No. 2 Project (FERC No. 2213) which lies between Swift No. 1 and Yale. Currently, PacifiCorp Energy operates Swift No. 2 for Cowlitz PUD under contract.

The Lewis Hydroelectric System was developed over a period of approximately 30 years. The first development, the Merwin project, was completed in 1931. The Yale project was completed next in 1953. The Swift No. 1 and Swift No. 2 projects were both completed in 1958.

1.1.1 Lewis River Settlement Agreement

In response to the FERC relicensing of the hydroelectric projects, interested parties collaborated on establishing a settlement agreement concerning future operations and responsive protection, enhancement and mitigation measures. On November 30, 2004, (Effective Date) 26 Parties (including two Licensees, five federal agencies, two state agencies, eight local/county agencies, two tribes, two citizens-at-large, and five non-governmental organizations) signed the Lewis River Settlement Agreement (PacifiCorp Energy and Cowlitz PUD 2004). In December 2004, the Licensees filed with the FERC the SA along with a Joint Explanatory Statement and Supplemental Preliminary Draft Environmental Assessment (PacifiCorp Energy and Cowlitz PUD 2004). The SA reflects the interests of all Parties; provides significant investments in fish and aquatic resources, wildlife and recreation; includes monitoring and evaluation and adaptive management; and includes ongoing coordination with the Parties through the Aquatics and Terrestrial Coordination Committees. The SA included support for 50-year licenses to allow the projects to continue to provide benefits to the Utilities customers. The Lewis River system allows PacifiCorp Energy to maximize the value of its generation assets and power purchases to provide customer benefits. Cowlitz PUD uses its Swift No. 2 power to serve primarily its residential load.

1.1.2 Environmental Impact Statement

In September 2005, the FERC released the Draft Environmental Impact Statement for the Lewis River Hydroelectric Projects (DEIS) (FERC 2005) for public comment. The DEIS was generally consistent with the SA in that it included most of the SA terms. In November 2005, the Parties filed comments on the DEIS. The FERC released the Final Environmental Impact Statement for the Lewis River Hydroelectric Projects on March 24, 2006.

1.1.3 Agency Terms and Conditions

The USDA Forest Service (USFS) submitted modified Terms and Conditions in November 2005 (USDA FS 2005). The US Fish and Wildlife Service (USFWS) and National Marine

Fisheries Service (NMFS) filed fishway prescriptions on February 22, 2006 and February 14, 2006, respectively.

1.1.4 Endangered Species Act Consultations

In January 2005, Cowlitz PUD and PacifiCorp Energy filed with the FERC Biological Evaluations (BEs) covering federally listed fish and wildlife in the Lewis River basin (PacifiCorp Energy and Cowlitz PUD 2005a, PacifiCorp Energy and Cowlitz PUD 2005b). The FERC modified the BEs, included them in the Final EIS and submitted the documents to the Services. The Proposed Action in the BEs is the SA. On September 15, 2006, the USFWS issued a Biological Opinion covering bull trout, northern spotted owls and bald eagles. The National Marine Fisheries Service issued its Biological Opinion covering their respective listed species on August 27, 2007.

1.1.5 Water Quality Certifications

Both Licensees applied to the Washington State Department of Ecology (Ecology) for Clean Water Act Section 401 Water Quality Certifications for their respective projects in February 2005. At Ecology's request, both Licensees withdrew and resubmitted those applications in December 2005. Ecology issued a Draft Certification Order for each of the Lewis River projects on February 10, 2006. Section 401Water Quality Certifications were issued to the Licensees and filed with the FERC on October 9, 2006.

Subsequently, Ecology issued an Order Amendment for the Swift No. 2 project on November 3, 2006 followed by a second Order Amendment (No. 4998) on December 21, 2007, addressing Conditions 4.6.3.e, 4.6.4.a, and 4.6.5.a. in Administrative Order 3676. Order Amendment No. 3 (No. 5531), issued by DOE on January 17, 2008 replaces Condition 3 of Amended Order 4998 (Condition 4.6.5.a of Order 3676).

PacifiCorp Energy filed with the FERC an Objection to Inconsistent 401 Certificates Pursuant to Section 15.2 of the Lewis River Settlement Agreement on November 16, 2006 and conducted two Alternative Dispute Resolution meetings with SA parties on December 11, 2006 and December 15, 2006. Parties reached a resolution at the December 15, 2006 meeting.

On December 21, 2007 the Washington Department of Ecology (Ecology) issued Amended Orders 5000, 4999 and 5001 for the Merwin (Order No. 3678), Yale (Order No. 3677) and Swift No. 1 (Order No. 3679) Certifications respectively. These amendments replaced conditions 4.6.3e, 4.6.4a and 4.6.5a of the Merwin, Yale and Swift No. 1 Certifications, as well as condition 4.6.4e of the Swift No. 1 Certification.

On January 17, 2008, Ecology issued Amended Orders 5329, 5328 and 5330 which replaces condition 4.6.5a as provided in Amended Order 5000 for the Merwin Certification, Amended Order 5328 replacing condition 4.6.5a as provided in Amended Order 4999 for the Yale Certification and Amended Order 5330 replacing condition 4.6.5a as provided in Amended Order 5001 for the Swift No. 1 Certification.

On October 3, 2008, Ecology issued Amended Orders 5743, 5972 and 5974 which replaces condition 4.2(1) and portions of 4.8(3) Table 2 as provided for in Amended order 5329 for the Merwin Certification, Amended Order 5972 replaces portions of 4.8(3) Table 2 as provided in Amended Order 5328 for the Yale Certification and Amended Order 5974 replaces portions of 4.8(3) Table 2 as provided in Amended Order 5330 for the Swift No. 1 Certification.

On June 22, 2009, Ecology issued Amended Order 6811 which modified the mixing zone for turbidity as it relates to construction of the Upper Release and Constructed Channel implementation.

On February 1, 2010, Ecology issued Amended Order 7325 which modifies Order 3679. Specifically, this amendment extends the expiration dated listed in section D. Duration of Order of amendment 6811 from December 31, 2009, to March 31, 2010.

On November 7, 2011, Ecology issued Amended Orders 8833, 8834 and 8831 which replaced conditions of Administrative Orders 3677,3678,and 3679, respectively, to comply with new water quality standard language modified by Washington Administrative Code (WAC 173-201A-600(1)(a)(ii)).

The Water Quality Certifications and associated amendments for the Swift No. 1, Swift No. 2, Yale and Merwin projects are available for viewing on PacifiCorp Energy's website at http://www.PacifiCorp Energy.com/es/hydro/hl/lr.html# - (Relicensing Documents).

1.1.6 New FERC Licenses

On June 26, 2008, the FERC provided the Utilities with new operating licenses for the Lewis River hydroelectric projects (Merwin Project No. 935, Yale Project No. 2071, Swift No. 1 Project No. 2111, and Swift No. 2 Project No. 2213). The license periods are each 50 years starting June 1, 2008. Each license includes the respective conditions of the services biological opinions and respective conditions of the Washington Department of Ecology 401 certificates. In general the licenses include terms of the Lewis River Settlement Agreement with few exceptions. Parties to the SA continue to abide by the SA terms including those terms outside the FERC requirements. As such this report may contain information not required by the FERC licenses.

1.1.7 2011 Annual Report and Consultation

PacifiCorp Energy and Cowlitz PUD prepared this 2011 Lewis River Hydroelectric Projects Annual Report (Annual Report) in consultation with the ACC and TCC. A draft report was provided to the ACC and TCC on March 8, 2011 for review and comment. Following a 30-day comment period ending on April 7, 2011, the Licensees reviewed the ACC and TCC comments and prepared this final Annual Report. This report was provided to the FERC and the Settlement Agreement Parties on April 15, 2011 to fulfill the requirements of Section 14.2.6 of the Settlement Agreement.

The period of record for the 2011 Annual Report is January 1, 2011 through December 31, 2011.

The following Plans and Reports were completed in 2011:

- Aquatics Fund Projects Annual Report – April 2011
- Wildlife Habitat Management Plan (WHMP Annual Plan for Operation Phase 2011) WHMP Annual Progress Report Operations Phase 2011
- Initial Evaluation of the Old-growth Stands on the Lewis River WHMP
- Aquatic Coordination Committee/Terrestrial Coordination Committee 2011 Annual Report
- Lewis River Habitat Preparation Plan – May 2011
- Lewis River Hatchery & Supplementation Program Annual Operations Report 2011
- Lewis River Hatchery & Supplementation Program 2012 Annual Operating Plan
- Lewis River Bull Trout Annual Operations Report - 2011
- Lewis River Bull Trout 2012 Annual Operating Plan
- Lewis River Bald Eagle Management Plan, September 2011
- Cougar Creek Kokanee Escapement Report - 2011

A water quality monitoring section (Section 4) of this Annual Report has been prepared in cooperation with Cowlitz PUD, and is provided in this Report.

1.2 ANNUAL REPORT ORGANIZATION

The 2011 Lewis River Annual Report provides the following information as required under Section 14.2.6 of the SA and the 401 Water Quality Certifications:

Section 2.0 Aquatics and Terrestrial Coordination Committees (ACC, TCC)

Section 2.1 ACC and TCC Membership

Section 3.0 Aquatic Resources

Section 3.1 ACC Meetings
Section 3.2 Aquatic Measures Implemented in 2011
Section 3.3 Aquatics 2011 Annual Plans

Section 4.0 Water Quality

Section 4.1 PacifiCorp Energy Water Quality Measures Implemented in 2011
Section 4.2 PacifiCorp Energy Water Quality 2011 Annual Plan
Section 4.3 Cowlitz PUD Water Quality Measures Implemented in 2011
Section 4.4 Cowlitz PUD Water Quality 2011 Annual Plan

Section 5.0 Terrestrial Resources

Section 5.1 TCC Meetings
Section 5.2 PacifiCorp Energy Terrestrial Measures Implemented in 2011
Section 5.3 PacifiCorp Energy Terrestrial 2011 Annual Plan
Section 5.4 Cowlitz PUD Terrestrial Measures Implemented in 2011
Section 5.5 Cowlitz PUD Terrestrial 2011 Annual Plan

Section 6.0 Law Enforcement

Section 6.1 Motorized Vehicle Issues, Vandalism and Malicious Mischief, Security and Public Safety Support

Section 7.0 Funding Tables

Section 8.0 Literature Cited

2.0 AQUATICS AND TERRESTRIAL COORDINATION COMMITTEES

Section 14 of the Lewis River Settlement Agreement includes several measures that define the Parties' roles and obligations. The full text of Section 14 of the Settlement Agreement is provided in Attachment B. The structure and process of the ACC and TCC is intended to provide a forum to address time-sensitive matters, early warning of problems, and coordination of member organization actions, schedule, and decisions to save time and expense. The ACC and TCC make decisions based on consensus, while implementing the Settlement Agreement.

More specifically, Section 14:

- Establishes the Aquatics Coordination Committee (ACC) and Terrestrial Coordination Committee (TCC).
- Establishes the Licensees' ACC and TCC Coordinators (Coordinators).
- Describes the coordination and decision making roles of the ACC and TCC.
- Requires the ACC and TCC to coordinate and Consult on development of plans by the Licensees.
- Requires the ACC and TCC to review information and oversee, guide, and make comments and recommendations on implementation and monitoring of the terrestrial and aquatic Protection, Mitigation and Enhancement (PM&E) Measures, including plans.
- Requires the ACC and TCC to establish, among other things:
    - i. Procedures and protocols for conducting committee meetings and deliberations to ensure efficient participation and decision making;
    - ii. Rules for quorum and decision making in the absence of any member;
    - iii. Alternative meeting formats as desired, including phone or teleconference; and
    - iv. The methods and procedures for updating committee members on interim progress of development and implementation of the terrestrial and aquatic PM&E Measures.
- Requires the ACC and TCC to establish subcommittees to carry out specified committee functions and responsibilities and establish the size of, membership of, and procedures for, any such subcommittees.
- Requires the Licensees' Coordinators to prepare and file with the FERC detailed annual reports on the TCC and ACC activities; monitoring and evaluations under the Monitoring and Evaluation Plan (M&E Plan) described in SA Section 9; implementation of the terrestrial and aquatics PM&E Measures occurring during the prior year; and plans for the coming year, and water quality monitoring information.
- Requires the Licensees to consult with the ACC and TCC when preparing the Annual Report.

2.1 ACC and TCC MEMBERSHIP

In December 2004 the Licensees appointed their respective ACC and TCC Coordinators. At the same time, the Licensees established the ACC and TCC, and invited the Parties to designate representatives (and alternates) for membership on these committees. Current Party representation for each committee is shown in Table 1 and Table 2. Seventeen Parties have designated representatives to the ACC and thirteen Parties designated representatives to the TCC.

Committee meetings were conducted in every month in 2011. During the year, the ACC and the TCC each respectively met 12 times.

The purposes of the Coordination Committee meetings were to:

- Develop study and monitoring plans.
- Discuss implementation strategies for PM&E measures.
- Oversee implementation of the PM&E measures.

Sections 3.1, 3.2, and 5.1 of this report summarize the ACC and TCC meetings and actions. The updates and results of the ACC Hatchery & Supplementation Plan Subgroup, ACC Monitoring & Evaluation Plan Subgroup and ACC Hatchery Engineering Subgroup are documented in the ACC meeting notes and are available upon request.

Table 1. ACC Members and Alternates.

ACC Member	Organization	Alternate
Kathryn Miller	American Rivers	Brett Swift
Public Works Director	City of Woodland	To be named
No representative at this time	Clark County	To be named
No representative at this time	Cowlitz County	To be named
Shannon Wills	Cowlitz Indian Tribe	Craig Olds
No representative at this time	Cowlitz-Skamania Fire District No. 7	To be named
Jim Malinowski	Fish First	To be named
No representative at this time	Lewis River Citizens at-large	To be named
Mariah Stoll-Smith Reese	Lewis River Community Council	To be named
Jeff Breckel	Lower Columbia River Fish Recovery	Eli Asher
Michelle Day	National Marine Fisheries Service	Bryan Nordlund
No representative at this time	National Park Service	To be named
No representative at this time	North County Emergency Medical	To be named
Frank Shrier	PacifiCorp Energy (PacifiCorp Co-Chair)	Erik Lesko
Diana M. Gritten-MacDonald	PUD of Cowlitz County (PUD Co-Chair)	To be named
No representative at this time	Rocky Mountain Elk Foundation	To be named
Paul Pearce	Skamania County	To be named
Bill Bakke	The Native Fish Society	To be named
Kathryn Miller	Trout Unlimited	Brett Swift
No representative at this time	US Bureau of Land Mgmt	To be named
LouEllyn Jones	US Fish & Wildlife	Lindsy Wright
Dave Hu	USDA Forest Service	Adam Haspiel
Pat Frazier	Washington Dept of Fish & Wildlife	Eric Kinne
No representative at this time	Washington Interagency Committee	To be named
No representative at this time	Woodland Chamber of Commerce	To be named
Bob Rose	Yakama Nation	To be named
No representative at this time	WA Recreation & Conservation Office	To be named

Table 2. TCC Members and Alternates.

TCC Member	Organization	Alternate
No representative at this time	American Rivers	To be named
Public Works Director	City of Woodland	To be named
Joel Rupley	Clark County	To be named
No representative at this time	Cowlitz County	To be named
Nathan Reynolds	Cowlitz Indian Tribe	Erik White
No representative at this time	Cowlitz-Skamania Fire District No. 7	To be named
No representative at this time	Fish First	To be named
No representative at this time	Lewis River Citizens at-large	To be named
Mariah Stoll-Smith Reese	Lewis River Community Council	To be named
No representative at this time	Lower Columbia River Fish Recovery	To be named
Michelle Day	National Marine Fisheries Service	To be named
No representative at this time	National Park Service	To be named
No representative at this time	North County Emergency Medical	To be named
Kirk Naylor	PacifiCorp Energy (PacifiCorp Co-Chair)	Kendel Emmerson
Diana M. Gritten-MacDonald	PUD of Cowlitz County (PUD Co-Chair)	To be named
Bob Nelson	Rocky Mountain Elk Foundation	Bill Richardson
Paul Pearce	Skamania County	To be named
No representative at this time	The Native Fish Society	To be named
No representative at this time	Trout Unlimited	To be named
No representative at this time	US Bureau of Land Mgmt	To be named
LouEllyn Jones	US Fish & Wildlife	To be named
Mitch Wainwright	USDA Forest Service	To be named
Peggy Miller	Washington Dept of Fish & Wildlife	Eric Holman
No representative at this time	Washington Interagency Committee	To be named
No representative at this time	Woodland Chamber of Commerce	To be named
Bob Rose	Yakama Nation	Joanna Meninick

3.0 AQUATICS RESOURCES

3.1 ACC Meetings

The purpose and role of the Aquatic Coordination Committee (ACC), as defined in Section 14.1 of the SA is to facilitate coordination and implementation of the aquatic PM&E measures.

The structure and process of the ACC is intended to provide a forum to address time-sensitive matters, early warning of problems, and coordination of member organization actions, schedule, and decisions to save time and expense. The ACC makes decisions based on consensus, while implementing the Settlement Agreement and FERC license requirements.

3.1.1 ACC Meetings and Conference Calls: Overview

This section summarizes the topics discussed and actions taken during ACC meetings and conference call(s) over the 12-month period.

ACC Meeting No. 1
January 13, 2011

- Discussed challenges and proposed solutions for the acclimation pond to be located at the Crab Creek site; four different designs will be submitted in the Environmental Assessment for review.

- The present members of the ACC agreed to move forward with current work for the Speelyai Intake Engineering Design as proposed with the inclusion that the current design and construction will not limit or preclude upstream and downstream fish passage at some later date.

- Updates were provided on the following:
  - Lewis River Hatchery ponds 13, 14 and 16;
  - Lewis River Hatchery intake pipe testing and repair;
  - Rearing ponds;
  - Ozone upgrades and switching;
  - Speelyai Kokanee trap;
  - *Hatchery and Supplementation Plan* - the final 2011 Annual Operating Plan (AOP) has been submitted to the ACC for review and comment with the 2010 Annual Report to follow before the end of January.
  - Swift Downstream Fish Collector;
  - Cougar Creek; and

  - Woodland Release Ponds.

ACC Meeting No. 2
February 10, 2011

- Each project proponent for the 2011 Lewis River Aquatics Fund presented their project to the ACC.

- The Lower Columbia Fish Enhancement Group made a request to resubmit a revised proposal by the end of the day as what they presented on at the meeting differed from the proposal (gravel vs. wood). The request was denied by group majority vote.

- The Crab Creek acclimation pond was discussed and options were reviewed. A net pen was determined to not be a viable option but a better alternative was not identified.

- PacifiCorp Energy requested an interim trap closure of the Merwin Upstream Trap from September 3 through October 6, 2011 for construction. NMFS requested further discussion while the rest of the group conceded.

- Updates were provided on the following :
  - *Hatchery and Supplementation Plan;*
  - Swift Downstream Fish Collector; and
  - Woodland Release Ponds.

ACC Meeting No. 3
March 10, 2011

- The Aquatics Fund proposals were discussed and it was decided that a separate conference call would be held to determine with which projects the ACC would be moving forward and funding.
  - This call was held March 29, 2011, and the following decisions were made:
    - The ACC supported funding the following projects -
      - Muddy River Side Channel Restoration, USDA Forest Service; and
      - Lewis River Side Channel Near Muddy River Instream Habitat Restoration, USDA Forest Service.
    - The ACC did not support funding the following project -
      - Muddy River Mainstem Restoration, USDA Forest Service.
    - The ACC held-off on making a decision on the following project -
      - Eagle Island Enhancement: Sites B and C, Cowlitz Indian Tribe.

- The Crab Creek acclimation pond site was revisited. PacifiCorp Energy proposed a naturalistic pond design that would incorporate an already existing scoured-out section of the creek and build it up into a full-sized pond. A group consensus was reached to move forward with designing this option.

- It has been nearly a year since the flow regime was implemented for the upper release and constructed channel at the Swift Canal. The ACC requested to revisit this project and a site visit was scheduled.

- The final design for the downstream release ponds was sent to the ACC for review.

- Updates were provided on the following:
    - Speelyai Hatchery intake and pond 14;
    - Lewis River Hatchery downstream intake and pond 16;
    - Speelyai Kokanee weir;
    - *Hatchery and Supplementation Plan*;
    - Merwin Upstream Fish Facility;
    - Swift Downstream Fish Collector;
    - *2011 Bull Trout Plan;*
    - Draft *2010 ACC/TCC Annual Report*

ACC Meeting No. 4
April 14, 2011

- A final conference call was held on April 6, 2011 regarding the Cowlitz Indian Tribe's proposal for Eagle Island Habitat Enhancement: Sites B and C. The determination was made to fund the project.

- Stillwater Sciences presented the Lewis River Standing Monitoring Study to the ACC. The ACC agreed to file the study report with FERC with no modifications.

- PacifiCorp announced that the 60 percent design for the Crab Creek acclimation pond would be ready for review by May 1, 2011. The design would be based on the ACC's last discussion and agreement.

- The final design for the release ponds located near Woodland, Washington was submitted to FERC. Cowlitz PUD and PacifiCorp advised the ACC that they are nearing closure on the land for the release ponds.

- The annual report for the *Hatchery and Supplementation Plan* had been submitted to the ACC for the 30-day comment period.

- Updates were provided on the following:
    - Lewis River Hatchery ponds 13, 14 and 16;
    - Speelyai Hatchery;
    - Merwin Upstream Fish Facility; and
    - Swift Downstream Fish Collector.

- PacifiCorp announced that, after consultation with USFWS and WDFW, the Utility would start transporting bull trout at Swift No. 1 this field season as part of the *Bull Trout Operating Plan*. Regular updates will be provided to the ACC as part of the agenda going forward.

- The USDA Forest Service is planning repairs and maintenance on the Swift Canal Bridge this summer. The impacts of this projected work were discussed.

- Due to weather and time constraints, the site visit to the Swift Canal to view the upper release flows and the constructed channel was cancelled and rescheduled for next month.

ACC Meeting No. 5
May 12, 2011

- The *Aquatics Fund 2011 Annual Report*, submitted to FERC and the ACC was reviewed; no comments were received from FERC or the ACC. The following projects were approved for funding:
  - Eagle Island Habitat Enhancement: Sites B and C from the Cowlitz Indian Tribe;
  - Lewis River Side Channel Near Muddy River Instream Habitat Restoration from the USDA Forest Service; and
  - Muddy River Side Channel Restoration from the USDA Forest Service.

- Kirk Naylor, chairperson of the Terrestrial Coordination Committee, discussed the BPA I-5 Transmission Line that is proposed to be built across PacifiCorp Wildlife Habitat Management Lands. The group discussed how this would impact the goals of both committees and what would be the appropriate next steps.

- Discussion was held regarding PIT tagging salmon and steelhead smolts, and whether it would be most effective to use full-duplex (FDX) or half-duplex (HDX) tags. Resolution was not reached and the item was tabled for next month.

- The USDA Forest Service submitted comments on the Lewis River acclimation pond 60 percent design package and these comments were addressed in the meeting.

- Updates were provided on the following:
  - Woodland Release Ponds – The Pacific eulachon has been listed as “threatened” under the ESA and this will impact the release pond project. PacifiCorp will coordinate with NMFS to address these impacts.
  - Dredging at the Lewis River Hatchery fish ladder;
  - Lewis River Hatchery ponds 13, 14, and 16;
  - Lewis River Hatchery pipe inspections and upper intake;
  - Speelyai Kokanee weir;

  - *Hatchery and Supplementation Plan*;
  - *Habitat Preparation Plan* – This has been sent to the ACC for 30-day comment period.
  - Bull Trout monitoring;
  - Swift Downstream Fish Collector.

- The USDA Forest Service announced that contract work for the proposed maintenance and repairs on the Swift Canal bridge would be going out to bid on May 13, 2011.

- The Washington Department of Ecology joined PacifiCorp and Cowlitz PUD to visit the constructed channel out of the Swift Canal and observe the upper release flows. They determined that there was no need for immediate change, but spawning and fish-use surveys were warranted to reasonably determine the efficacy of the flows.

ACC Meeting No. 6
June 9, 2011

- Discussion continued regarding the issue of FDX as compared to HDX PIT tags for salmon and steelhead smolts. PacifiCorp intended to use HDX tags while the Cowlitz Indian Tribe, NMFS, and WDFW wanted to use FDX; Fish First and USFWS wanted more information before making a determination. The group decided to form a subcommittee and have a separate meeting to discuss the issue in more detail.

- Updates were provided on the following:
  - Woodland Release Ponds – PacifiCorp has signed the purchasing documents for the land and is waiting for FERC approval before the ownership can become official.
  - Lewis River Hatchery Pond 16 and upstream Intake;
  - Merwin rearing pond header modifications;
  - Speelyai kokanee weir, pond 14, and intake modifications;
  - *Hatchery and Supplementation Plan*;
  - *Habitat Preparation Plan*;
  - Bull trout monitoring;
  - Merwin Upstream Fish Facility; and
  - Swift Downstream Fish Collector.

ACC Meeting No. 7
July 14, 2011

- Updates were provided on the following:
  - Woodland Release Ponds;
  - *Hatchery and Supplementation Plan* – The H&S subgroup met to discuss the AOP for 2012, including the wild winter steelhead program, fall monitoring for Coho, and collection of steelhead, Chinook and Coho.

  - *Habitat Preparation Plan*;
  - Lewis River Hatchery pond 16, and the upstream and downstream intakes.
  - Merwin rearing pond header modifications and ozone system upgrades;
  - Speelyai Kokanee weir, pond 14 and intake modifications;
  - Bull trout monitoring – Collection is underway and fish are being tagged, genetically sampled, and transported;
  - Merwin Upstream Fish Facility; and
  - Swift Downstream Fish Collector.

- A subgroup was formed to research and propose resolution to the issue of HDX as compared to FDX PIT tags and a meeting was scheduled.

- A private landowner on Swift reservoir submitted a request to PacifiCorp to build a dock on the reservoir. PacifiCorp requested that the ACC and TCC both review the request and propose feedback. The ACC discussed the request and came to a consensus that the request did not meet the requirements of the Shoreline Management Plan to allow the dock to be built on the reservoir.

ACC Meeting No. 8
August 11, 2011

- PacifiCorp reported back to the ACC the results of the PIT tag subgroup meeting. The group included NMFS, Cowlitz Indian Tribe, RFID, R2 Consultants, NOAA Fisheries, and WDFW. The Yakama Nation provided comments via email. Based on the input received and the technical details provided, PacifiCorp agreed to use FDX tags as originally outlined in the *Monitoring and Implementation* (M&E) plan.

- Updates were provided on the following:
  - Merwin Upstream Fish Facility;
  - Swift Downstream Fish Collector;
  - Woodland Release Ponds;
  - Dredging at the Lewis River Hatchery Fish Ladder;
  - Acclimation Ponds;
  - *Hatchery and Supplementation Plan*- The subgroup is nearing finalization of the 2012 AOP.
  - Merwin rearing ponds;
  - Lewis River Hatchery pond 16;
  - Speelyai Kokanee Weir, pond 14 and intake; and
  - Bull trout

- WDFW expressed concern regarding the projected run rate for Coho this year and the ability to collect enough fish to meet the projected numbers as outlined in the *Habitat Preparation Plan (HPP)* and the SA. The group agreed on the following prioritization of the adult fish collected:
  1. Hatchery broodstock;

2. Habitat preparation plan;
3. Nutrient enhancement; and
4. Food bank.

Numbers three and four could be interchanged depending on the condition of the fish.

- PacifiCorp announced that FERC had issued a directive that work be done on the Swift dam spill gate and this would require lowering the reservoir below the spill crest prior to the work being done. This will mean moving more water in the winter than usual, and if it is a wet winter, that means high flows.

- The USDA Forest Service provided an update on the Swift Canal Bridge work being done. There will be a public notification regarding closures of the bridge.

ACC Meeting No. 9
September 8, 2011

- PacifiCorp Energy advised the ACC that the Aquatics Funding cycle is about to begin for 2012 and reviewed a spreadsheet of what has been done in the past and projects that are still pending.

- Updates were provided on the following:
  - Merwin Upstream Fish Facility;
  - Swift Downstream Fish Collector;
  - Woodland Release Ponds – PacifiCorp has received FERC approval, submitted the final design, and closed on the property on which the release ponds will be constructed.
  - *Hatchery and Supplementation Plan* – The subgroup continues to work on finalizing the 2012 AOP;
  - Merwin rearing ponds;
  - Lewis River Hatchery pond 16 and intake;
  - Speelyai Kokanee weir, intake, and pond 14;
  - *Habitat Preparation Plan*; and
  - Bull trout

- The ACC discussed what to do with the large woody debris (LWD) that has been gathered from the reservoirs and is being temporarily stored on PacifiCorp lands. The group suggested checking with the USDA Forest Service first for use on their Aquatic Fund project, and if they do not want the logs, then it would be permissible for the Terrestrial Coordination Committee to use them for their terrestrial habitat projects.

ACC Meeting No. 10
October 13, 2011

- PacifiCorp Energy advised that the closing date for Aquatic Fund pre-proposals was up-coming and that close-out reports concerning Aquatic Fund projects completed in 2010 were now available.

- PacifiCorp Energy gave an update on the Merwin Upstream Fish Facility and issues the project is currently facing. The discussion was tabled until further information could be gathered.

- Updates were provided on the following:
  - Woodland Release Ponds
  - Swift Downstream Fish Collector;
  - Hatchery and Supplementation Plan – The subgroup continues to work on finalizing the 2012 AOP;
  - Merwin rearing ponds;
  - Lewis River Hatchery pond 16 and intake;
  - Speelyai Kokanee weir, intake, and pond 14;
  - Habitat Preparation Plan
  - Bull trout
  - Anadromous Fish Reintroduction

- Discussion took place concerning fish trucks purchased by PacifiCorp Energy for the anadromous fish reintroduction effort and if these trucks were in use yet.

- The ACC discussed the possibility of the upstream acclimation pond sites at Crab Creek, Clear Creek and the Muddy River and their potential impact to over-wintering elk.

- The meeting then adjourned and site visits of the Swift Downstream Fish Collector and Merwin Upstream Fish Collector took place.

ACC Meeting No. 11
November 10, 2011

- PacifiCorp Energy gave an update on the annual bull trout monitoring planning process. The ACC discussed changes to this process that will occur in 2012.

- Updates concerning Aquatic Fund projects were discussed. Discussion centered on close-out reports from the prior year, as well as project pre-proposals for the current funding year.

  - Updates were provided on the following:
  - Woodland Release Ponds
  - Swift Downstream Fish Collector;
  - Hatchery and Supplementation Plan – The subgroup continues to work on finalizing the 2012 AOP;
  - Merwin rearing ponds;
  - Lewis River Hatchery pond 16 and intake;
  - Speelyai Kokanee weir, intake, and pond 14;
  - Habitat Preparation Plan
  - Bull trout
  - Anadromous Fish Reintroduction

- An update was given to the ACC concerning snorkel surveys currently being performed within the Swift Bypass Reach per the Utilities 401 Water Quality Certification.

- PacifiCorp Energy presented information concerning Section 4.1.9 of the Lewis River Settlement Agreement which calls for studies to assess future fish passage facilities within the hydro system. A Request For Proposal was issued and bids were in to complete the studies.

ACC Meeting No. 12
December 8, 2011

- The meeting began with a review and discussion of the 2012 Aquatic Fund pre-proposal projects.

- Updates were provided on the following:
  - Woodland Release Ponds
  - Swift Downstream Fish Collector;
  - Hatchery and Supplementation Plan – The subgroup continues to work on finalizing the 2012 AOP;
  - Merwin rearing ponds;
  - Lewis River Hatchery pond 16 and intake;
  - Speelyai Kokanee weir, intake, and pond 14;
  - Habitat Preparation Plan
  - Bull trout
  - Anadromous Fish Reintroduction

- The ACC discussed the recent ESA listing of Eulachon and the Consultation required concerning these fish. It was expressed that this consultation period may delay some reintroduction construction projects.

- The recent snorkel of the Swift Bypass Reach by the Utilities and WDOE was then discussed along with the concerns WDOE has with the lack of spawning gravels in the reach.

- An update was given concerning the RFP for Future Fish Passage Studies. Several proposals had been submitted and the Utility was in the process of evaluating.

- Large Woody Debris collected from Yale Reservoir for the purpose of aquatic habitat projects was discussed. The LWD was on-site at Yale and ready to be transported.

3.1.2 ACC Meeting Notes

The Licensees prepared draft notes for ACC meetings and conference calls. These notes were distributed to ACC members for review and comment approximately one week after the subject meeting. After review, revision and approval by the ACC, the final notes were entered in the public record and posted on the PacifiCorp Energy web site (http://www.PacifiCorp Energy.com/es/hydro/hl/lr.html# - License Implementation > ACC).

3.2 Aquatic Measures Implemented as of the End of 2011

This section presents the actions taken by the Utilities during January 2011 through December 2011 toward Aquatic requirements of the Lewis River Settlement Agreement and FERC licenses. It also includes previously completed Settlement Agreement actions. The actions are identified by agreement Article number as the agreement is more specific in detailing the requirements than the license orders which in essence, incorporate agreement terms via agency regulatory authority. In some instances previous actions are noted to provide a more comprehensive record.

A discussion of the activities associated with each of the PM&E measures is presented below for the 2011 report period. Previous completed actions are identified in Table 3 and were previously described in prior annual ACC/TCC reports. A description of funding amounts deposited and disbursed during 2011 is provided in Section 7.0 – Funding.

Table 3. Implementation schedule and status of PM&Es.

Key	
	Due Date
x	In Progress
●	Complete

SA Section	PM&E	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015+
2.0 COORDINATION COMMITTEES													
14.2.6	ACC/TCC Annual Reports		●	●	●	●	●	●	●				
3.0 AQUATIC RESOURCES													
4.1.1	Merwin Tailrace Fish Behavior		x	x	●								
4.1.4(c)	Adult Trap Efficiency for Salmonids				x	●							
4.1.8(b)	Upstream Transport Plan						●						
4.1.8(e)	Downstream Transport Plan						●						
4.2(d)	Interim Merwin Trap Operations		x	x	x	x	x	x	x				
4.3	Merwin Upstream Collection and Transport Facility design			x	x	x	●						
4.4	Swift Downstream Facility design			x	x	x	●						
4.4.3	Release Ponds Design			x	x	x	x	x	x				
4.5	Yale Downstream Passage												
4.6	Merwin Downstream Passage												
4.7	Yale Upstream Passage												
4.8	Swift Upstream Passage												
4.9.1	Interim Bull Trout Collection and Transport Programs		●	●	●	●	●	●	●				
4.9.2	Investigation of Alternative Collection Methods			x	x	x	x	x	x				
4.9.3	Bull Trout Entrainment Reduction			x	x	x	●						
4.10	Bull Trout Passage in the Absence of Anadromous Fish Facilities												
5.1	Yale Spillway Modifications design						●						
5.2	Bull Trout Habitat Enhancement Measures	●											
5.5	Bull Trout Limiting Factors Analysis			x	●								
5.7	Public Information Program to Protect Bull Trout					●	●	●	●				
6.1.2	Swift No. 1 Construction of Upper Release Point					x	x	●					
6.1.3 (b)	Swift No. 1 Constructed Channel					x	●						
7.1	Large Woody Debris Program					●	●	●	●				
7.2	Spawning Gravel Study and Gravel Monitoring and Augmentation Plan			x	x	●							
7.3	Predator Study												
7.4	Habitat Preparation Plan		●	●	●	●	●	●	●				
7.5	Aquatics Fund		x	●	●	●	●	●	●				

Key	
	Due Date
x	In Progress
●	Complete

SA Section	PM&E	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015+
8.2	Hatchery and Supplementation Plan		x	x	x	x	●	●	●				
8.3	Anadromous Fish Hatchery Adult Ocean Recruit Target by Species						●						
8.5	Supplementation Program												
8.6	Resident Fish Production		x	x	x	x	●	●	●				
8.7	Lewis Hatchery Pond 15 Construction					x	●						
8.7	Speelyai Hatchery Ponds Construction					x	●						
8.7	Swift Net Pens Permitting					x	●						
8.7	Lewis Hatchery Ponds 13, 14 & 16 Design					x	x	●					
8.7	Merwin Hatchery Ponds Design/Construction					x	x	●					
8.7	Speelyai Spawn Building Extension						x	●					
8.7	Lewis River Hatchery Downstream Water Intake Design						x	●					
8.7	Speelyai Hatchery Kokanee Weir						x	x	x				
8.8	Juvenile Acclimation Sites design-above Swift						x	●	x				
8.8	Juvenile Acclimation Sites -Yale/Merwin												
9.1	Monitoring and Evaluation Plan						x	●					
9.4	Water Quality Monitoring				●	●	●	●	●				
9.6	Bull Trout Monitoring	●	●	●	●	●	●	●	●				
9.7	Resident Fish Assessment												
4.0 WATER QUALITY													
Section 4.8 of 401 Cert	Water Quality Management Plan					x	x	x	x				
5.0 TERRESTRIAL RESOURCES													
10.1.1	Yale Land Acquisition and Habitat Protection Funding		●	●	●	●	●	●					
10.2.1	Swift No. 1 and Swift No. 2 Land Acquisition and Habitat Protection Fund & Tracking Account						●	●					
10.8	Wildlife Habitat Management Plan		x	x	x	●	●	●	●				
10.8.2	Wildlife Habitat Management Plan Fund					●	●	●	●				
10.8.3	Utilities Wildlife Habitat Management Plan Annual Plan					●	●	●	●				
14.2.6	Utilities Wildlife Habitat Management Plan Annual Report					●	●	●	●				
6.0 LAW ENFORCEMENT													
13.2.1	Law Enforcement				x	●	●	●	●				

3.2.1 SA Section 4.1 Common Provisions Regarding Fish Collection and Transport Facilities

Studies to Inform Design Decisions (SA 4.1.1)
PacifiCorp Energy has completed the Merwin Tailrace Fish Behavior study to provide information that could assist the planning and design of the Merwin Upstream Collection and Transport Facility. The study plan was developed in coordination with the ACC and was finalized as a revised document on June 30, 2005. In 2005 through 2006, the study was conducted and a final report was issued in February 2007.

Adult Trap Efficiency for Salmonids (SA 4.1.4c)
The Adult Trap Efficiency (ATE) standard was first discussed by the ACC at the February 14, 2009 meeting. Bryan Nordlund of NMFS subsequently developed a proposal for the ATE standard along with a matrix for a phased fish trap implementation. This proposal was the topic of nearly every ACC and Engineering subgroup meeting for most of the year accompanied by several offline conversations. An ATE determination methodology and standard was finally accepted by the ACC at their December 11, 2009 meeting with the efficiency set at 98%. Detailed methodology and definitions were delegated to the Draft Monitoring and Evaluation Plan which was submitted to the FERC in June 2009 and approved in December 2010.

3.2.2 SA Section 4.2 Merwin Trap

Merwin Trap Flow Restrictions (SA 4.2b)
To provide a margin of safety for personnel, PacifiCorp Energy limited the 2011 river discharge at Merwin dam/powerhouse to 5,500 cfs or less as river flow conditions warranted when personnel were in the trap. Flow limitations were coordinated with WDFW hatchery staff.

Merwin Trap Upgrades (SA 4.2c)
On November 29, 2005 PacifiCorp Energy provided the Services (USFWS and NOAA Fisheries) and WDFW a letter requesting a meeting to discuss potential upgrades and operational procedures to improve operating conditions for personnel working in the Merwin Trap by providing a greater margin of safety. Attached to the letter was a memo that identified company proposed measures and a supporting Engineering Study (Report No. RES 3000028924).

Final designs were submitted to the FERC on February 2, 2007 and acceptance received from the FERC on February 12, 2007. Final designs and the FERC correspondence are available upon request.

Interim Merwin Trap Operations (SA 4.2d)

For 2011, the Merwin Trap was operated in coordination with WDFW to collect hatchery fish returning from the ocean and to transport any bull trout collected to Yale reservoir. Per the SA, WDFW increased frequency of trap cleanout to daily during the work week (Monday - Friday) unless flows or inadequate staff prevented such effort. PacifiCorp Energy coordinated with WDFW and made reasonable efforts to operate the Merwin powerhouse to allow fish trapping operations at the trap. Fish other than hatchery fish or wild winter steelhead were returned to the river downstream of Merwin Dam.

3.2.3 SA Section 4.3 Merwin Upstream Collection and Transport Facility

On March 2, 2009, PacifiCorp Energy submitted to the subgroup and the ACC the 60 percent design report. Following comments on the 60 percent design report, the subgroup worked on developing the design to a 100 percent level. On June 26, 2009, the subgroup was provided the 90 percent design report. Following the review period, PacifiCorp Energy worked with the subgroup to finalize the report. A 100 percent design report was submitted to the FERC on December 23, 2009. No subgroup meetings were conducted in 2011. Periodic project updates were provided at monthly ACC meetings.

3.2.4 SA Section 4.4 Downstream Transport at Swift No. 1 Dam

Release Ponds (SA 4.4.3)

In 2006, PacifiCorp Energy notified the ACC representatives that the company was working to secure a site for the Release Ponds. PacifiCorp Energy initially worked with WDFW to secure acquisition of a site just downstream of Woodland, Washington. The site met the criteria established in the SA and the land was available for trade with WDFW.

In 2009, PacifiCorp Energy discovered that the identified WDFW parcel was much smaller than originally recorded with the county and was not of suitable size. PacifiCorp Energy then initiated talks with the adjacent landowner to pursue either purchase or lease. Discussions with continued through to October 2010, at which point the adjacent landowner withdrew from negotiations.

In November 2010, PacifiCorp Energy initiated an effort to find an alternate site upriver from the previously considered location. A site was selected and purchased and final designs updated. The site is on approximately 5 acres near River Mile 9 near the town of Woodland, Washington. PacifiCorp is currently preparing documentation for formal consultation with NMFS on Eulachon smelt (*Thaleichthys pacificus*) and associated critical habitat.

3.2.5 SA Section 4.5 Downstream Passage at Yale Dam

Implementation scheduled prior to 13th anniversary of Yale Project License.

3.2.6 SA Section 4.6 Downstream Passage at Merwin Dam

Implementation scheduled prior to 17th anniversary of Merwin Project License.

3.2.7 SA Section 4.7 Upstream Passage at Yale Dam

Implementation scheduled prior to 17th anniversary of Yale Project License.

3.2.8 SA Section 4.8 Upstream Passage at Swift Projects

Implementation scheduled prior to 17th anniversary of Swift No.1 Project License.

3.2.9 SA Section 4.9.1 Interim Bull Trout Collection and Transport Programs

Per the FERC licenses' Article 402(a) and the Lewis River SA section 4.9.1, PacifiCorp Energy, in cooperation with the WDFW, annually captures and transports bull trout from the Yale powerhouse tailrace (upper Merwin reservoir) to the mouth of Cougar Creek, a Yale reservoir tributary. A total of 141 bull trout have been captured from the Yale Tailrace since the program began in 1995.

To capture bull trout from the Yale tail waters, monofilament or multifilament mesh tangle nets are used (typically 2.5'' stretch). Netting occurs on a weekly basis beginning in June and ending mid-August, between the hours of 0900 and 1200 hours. During this time, the powerhouse generators are taken off-line to facilitate deployment and handling of the nets. Powerboats are used to tie the nets to the powerhouse wall and stretch them across the tailrace area. The nets are then allowed to sink to the bottom. Depending on conditions or capture rate, the nets are held by hand on one end or allowed to fish unattended. The maximum time nets are allowed to fish is ten minutes.

Upon capture of a bull trout, fish are immediately freed of the net (usually by cutting the net material) and placed in a live well. Captured fish are measured to their caudal fork, inserted with a uniquely coded PIT tag, sampled for genetic tissue, and weighed to the nearest gram. As in the Swift Reservoir, all captured bull trout were weighed with a hand-held scale. The scale was attached to a net, allowed to tare to zero, and the captured fish placed in the net and weighed. Along with fork length information, the weights of captured bull trout will be used to assess the condition factor (K-factor) of fish residing in Lake Merwin.

Once biological information is gathered and tags are inserted, the bull trout is placed in a live box within the stream. After collection activities are completed for the day, all captured bull trout are transported to an awaiting fish-tank truck and transported upstream.

For results concerning number of bull trout captured and transported during 2011 Yale Tailrace activities as well as pertinent biological and genetic information of individual bull trout captures, please see Attachment D *Lewis River Bull Trout 2011 Annual Report*.

Investigation of Alternative Collection Methods (SA 4.9.2)

PacifiCorp continues to consider more effective and less intrusive methods to collect bull trout from the Yale tailrace. Past alternative methods investigated include; beach seines, purse seines, drifting tangle nets when the powerhouse is online, and angling.

In 2011, tangle nets and angling were the only methods used and, to date, remain the most effective. PacifiCorp continues research on possible alternative methods of effective capture and transport. Investigation of each concept or pilot test conducted at other Northwestern dams has not demonstrated a better alternative than the current method.

Yale and Merwin Bull Trout Entrainment Reduction (SA 4.9.3)
PacifiCorp Energy completed and distributed a revised *Yale Project Entrainment Reduction Plan* to the ACC and the Services on May 16, 2008. The plan is available on PacifiCorp Energy's website:
http://www.PacifiCorp Energy.com/content/dam/PacifiCorp Energy/doc/Energy_Sources/Hydro/Hydro_Licensing/Lewis_River/Yale_Hydro_Project_Bull_Trout_Entrainment_Final_Report_and_Bull_Trout_Reduction_Plan_January_2008.pdf

3.2.10 SA Section 4.10 Bull Trout Passage in the Absence of Anadromous Fish Facilities

If Yale Downstream Facility is not built, implement prior to 13th anniversary of Yale Project License.

3.2.11 SA Section 5.1 Yale Spillway Modifications

PacifiCorp has submitted a design for a spillway barrier net to the FERC for approval. This net is similar in design and made of material similar to the Entrainment Reduction net in Yale Reservoir. The net is designed to exclude bull trout from the spillway at any spill flow less than 6,000 cfs (the average spill volume for Yale Spillway).

3.2.12 SA Section 5.2 Bull Trout Habitat Enhancement Measures

PacifiCorp Energy continued to manage the Cougar Creek Conservation Covenant to the benefit of bull trout. Noxious weeds (scotch broom and Himalayan blackberry) were identified and treated along the transmission Right Of Way (ROW) and in previously tree harvested lands along Panamaker Creek.

A habitat improvement project on Panamaker Creek was submitted by PacifiCorp Energy through the 2007/2008 Aquatic Habitat Fund process. This project was completed in August 2008 and had the following benefits:

- Reduced sediment input through the decommissioning of one mile of road;
- Removal of nine culverts and installation of ten cross ditches for runoff control; and
- Re-vegetation of all disturbed soils.

Per the SA, Cowlitz PUD managed the Devil's Backbone Conservation Covenant to benefit bull trout.

3.2.13 SA Section 5.3 Reserved

3.2.14 SA Section 5.4 Reserved

3.2.15 SA Section 5.5 Bull Trout Limiting Factors Analysis

Contract was awarded to Meridian Environmental, Inc (the Consultant). The Consultant completed the field work and provided a final report in May 2007. The report describes three potential streams that could support bull trout if improvements were made to the habitat. The improvements include shading to reduce stream temperatures and riparian habitat stabilization. An overriding limiting factor in two of the three streams was lack of water during the critical spawning period.

3.2.16 SA Section 5.6 Public Information Program to Protect Listed Anadromous Species

PacifiCorp Energy will install new anadromous species informative signs in 2012.

3.2.17 SA Section 5.7 Public Information Program to Protect Bull Trout

PacifiCorp Energy continues work to redesign new signage. Bull trout fliers were made available to the public at formal recreation sites. In cooperation with the WDFW, PacifiCorp Energy also has placed regulatory signage at Eagle Cliff to clarify the selective fishery rules in effect in that area to better protect bull trout. See examples below:

Figure 1. Signs posted for public information.

3.2.18 SA Section 6.1 Flow Releases in the Bypass Reach: Upper Release and Constructed Channel

Completion of Upper Release Point (SA 6.1.2)

Upper Release Point water flowed continuously throughout 2011 with few exceptions (Figure 2). On June 28, 2011, the flow meter indicated a drop in flow after the Swift No. 1 Units tripped. However, spill was initiated immediately upon detection of the flow variance and flow level recovered within the hour. This did not qualify as a flow variance according to the Monitoring and Evaluation Plan (M&E Plan) which calls for top-of-the-hour average flow as the standard. A similar turbine trip and flow interruption occurred on December 30, 2011. Once again, a spill gate was opened to maintain flow and the top-of-the-hour average flow was not out of compliance. (Figure 3).

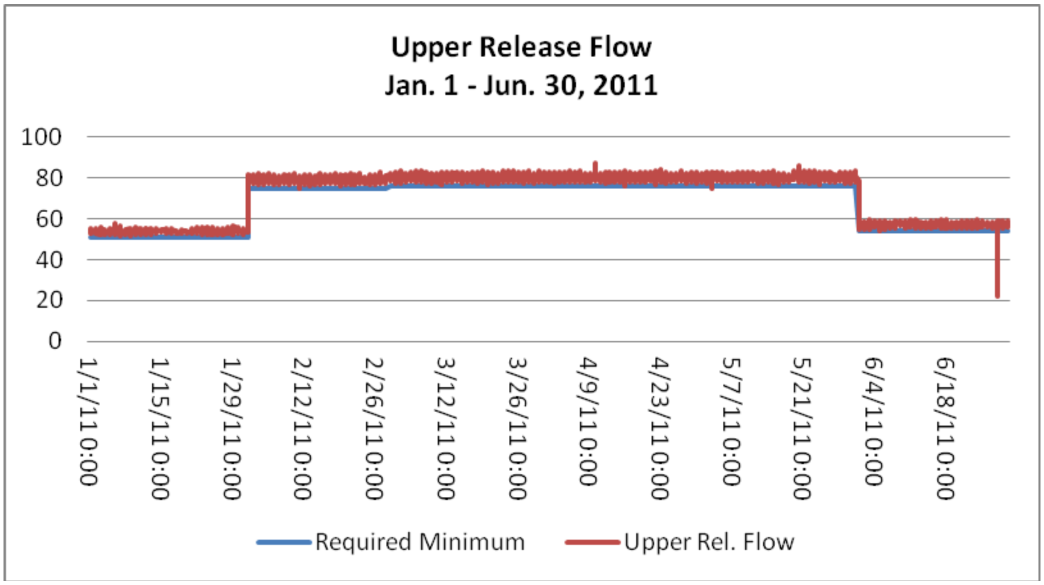

Figure 2. Hourly Upper Release flows from January 1 to June 30, 2011.

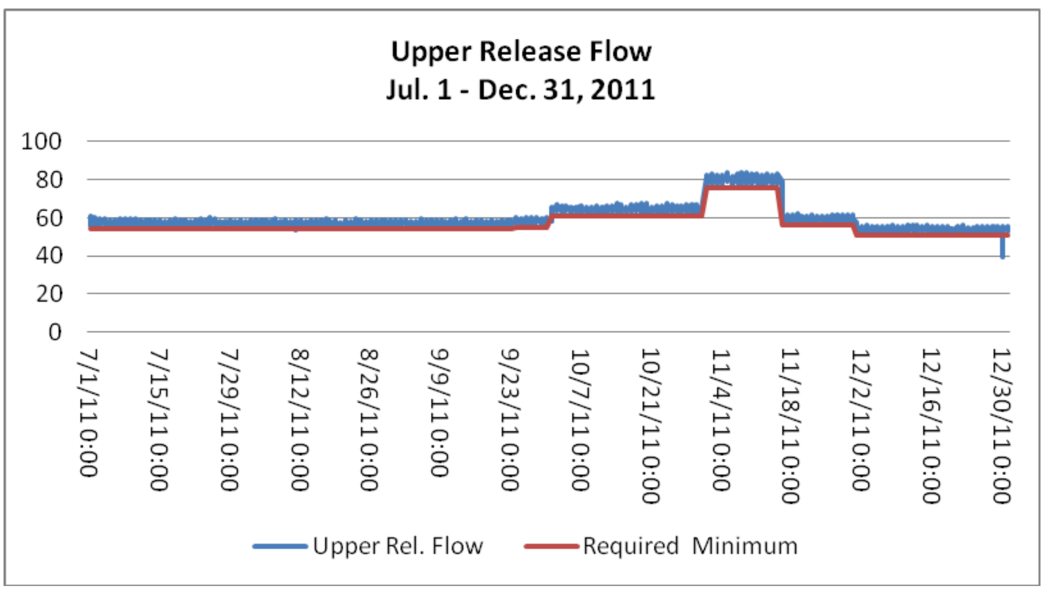

Figure 3. Hourly Upper Release flows from July 1 to December 31, 2011.

Constructed Channel (SA 6.1.3b)
Beginning in fall 2011, a flow monitoring gage was installed at the Canal Drain outlet to provide a minimum flow alarm system and better flow measurement. There was no flow excursions recorded for 2011.

Hourly canal drain flows for 2011 will be presented in the final distribution of this report.

3.2.19 SA Section 6.2 Flow Fluctuations and Ramp Rates below Merwin Dam

Merwin Project flows and ramp rates were implemented as stipulated in the June 26, 2008 FERC license. One ramp rate excursion occurred in calendar year 2011 and is summarized below:

The Merwin project was operating at full load and had started down ramping in the early evening on Saturday, March 19, 2011. When Unit No. 3 was completely shut down, the operator attempted to begin ramping down Units 1 and 2 simultaneously but the wicket gates would not budge from full open. So a mechanic went into the turbine area to close the wicket gates manually to get them moving again. While doing that manual adjustment, the mechanic went too far on the first adjustment which resulted in a 0.205 ft. down ramp instead of the required 0.17 ft. for that one hour. After that the operator could use the mechanical controls to continue the down ramp without any further excursions.

3.2.20 SA Section 7.1 Large Woody Debris Program

During 2011, PacifiCorp Energy continued the Large Woody Debris (LWD) program as per its Hydraulic Project Approval (HPA) on all three reservoirs. Approximately 120 logs removed from Merwin Reservoir were stockpiled in an enclosed area near the Yale Warehouse and were offered to both the U.S. Forest Service and Cowlitz Indian Tribe for use in the watershed. No logs were available from the Swift Reservoir in 2011.

Due to the cost of PacifiCorp Energy insurance requirements, neither party was able to provide a contractor to pick up the logs in 2011 at the Yale Warehouse. The logs remain available for use in 2012 and PacifiCorp Energy rolled the $2,000 allocated to defray the costs of LWD transportation into the 2012 budget (SA 7.1.1) for a total of $4,000. In addition, PacifiCorp Energy has offered, on a one-time basis, to use its contractor in 2012 to move the logs from the Yale Warehouse for the Cowlitz Indian Tribe and offset the additional transportation costs with ACC funding as approved by the ACC.

3.2.21 SA Section 7.2 Spawning Gravel Study and Gravel Monitoring and Augmentation Plan

In 2006, PacifiCorp Energy completed a Spawning Gravel Report for downstream of Merwin dam and proposed to monitor gravel movement for two years before making recommendations and developing a final gravel augmentation plan. A summary report was provided to the ACC on December 20, 2007, regarding completion of two tasks for the Lewis River Spawning Gravel Evaluation. In 2008, the third year of mapping the spawning gravel areas and analyzing the accumulated data was completed. Some of the key findings were that spawning habitat is likely limiting to the local Chinook salmon population. Available spawning gravel does not appear to be diminished in the upper reach and the gravel appears to be stable. Adding more spawning gravel would not necessarily increase the spawning area due to the effect of the confined canyon geomorphology.

PacifiCorp Energy provided an annual report to the ACC and monitored the gravel sites in the fall of 2008 in order to provide more refinement to the model for gravel movement and an applicable trigger or gravel augmentation. A final report update and recommendations was submitted in January 2009.

3.2.22 SA Section 7.3 Predator Study

Implementation scheduled prior to 13th anniversary of Merwin Project License.

3.2.23 SA Section 7.4 Habitat Preparation Plan

As part of it new operating licenses, PacifiCorp Energy produced a draft 2011 Habitat Preparation Plan (HPP) and provided this plan to the ACC on April 27, 2011, for a 30-day comment period. After this review period, PacifiCorp Energy finalized the 2011 HPP and submitted the final plan to the FERC on June 7, 2011, in accordance with Article 401 of the FERC operating licenses.

Fish transportation activities in accordance with the 2011 HPP began on September 20, 2011, with the transportation of early coho salmon upstream of Swift dam. In total, 2,000 adult coho equally split among males and females were transported from the lower Lewis River to upstream of Swift dam. Transportation of coho ended on October 11, 2011 (Table 4).

	Early Coho Salmon	
Date	**Males**	**Females**
9/20/2011	230	230
9/21/2011	381	355
9/22/2011	125	110
9/27/2011	130	130
10/4/2011	109	134
10/11/2011	25	41
Total	1000	1000

Table 4. Coho and spring Chinook transported from Lewis River Hatchery ladder to Swift Reservoir in 2011.

3.2.24 SA Section 7.5 Aquatics Fund

PacifiCorp Energy continues to annually make funds available for Aquatic resource projects in accordance with the *Aquatics Fund – Strategic Plan and Administrative Procedures*.

In 2011, funding in the amount of $154,800 was distributed to previously-approved Aquatic projects (see 3.3.27 below for details).

In September 2011, a new funding cycle was initiated. Seven pre-proposals were submitted. After an initial evaluation, six proposals were selected for further consideration. These proposals will be evaluated and a decision for new project funding will occur in March 2011.

An internal audit was conducted by PacifiCorp of the funding amounts as detailed in the Settlement Agreement. As a result of this audit, additional monies were added to the tracking spreadsheet shown in Section 7.0 to account for money that had been added to the fund but not previously reported.

Funding not spent in 2011 (along with interest accrued) will remain in the account for use in 2012 or future years. The total amount available as of December 31, 2011 was $989,635.96 (see Section 7.0). The Licensees will continue to provide additional money to the Aquatic Fund on an annual basis as stipulated in the SA.

3.2.25 SA Section 7.6 In Lieu Fund

Implementation to be determined by NOAA Fisheries and USFWS following the Services' evaluation of new information on fish passage at Merwin and Yale projects by year nine of the licenses.

3.2.26 SA Section 7.7 Management of Aquatics Fund and In Lieu Fund

PacifiCorp Energy awarded $209,000 for Aquatic habitat projects in 2011. At the end of 2011, PacifiCorp Energy's total available fund amount was $989,635.96 for Resource Projects and $535,625.23 for Bull Trout Projects.

Fund account information is provided in Section 7.0.

ACC approved four 2010/2011 *Lewis River Aquatics Fund – Resource Projects* as follows:

- USDA Forest Service:
  - Lewis River Side Channel Near Muddy River Instream Habitat Restoration
  - Muddy River Mainstem Restoration
  - Muddy River Side Channel Restoration
- Cowlitz Indian Tribe:
  - Eagle Island Habitat Enhancement Sites B and C

3.2.27 SA Section 7.8 Execution of Projects and Mitigation Measures

The following projects were funded in 2011:

- USDA Forest Service
  - Pine Creek Instream Floodplain Structures (Bull Trout & Steelhead): $32,500 from Fund 7.5 – Aquatics Resource, and $32,500 from Fund 7.5 – Bull Trout.
  - Pepper Lewis Side Channel Habitat: $41,300 from Fund 7.5 – Aquatics Resource

- Muddy River Side Channel Restoration: $39,000 from Fund 7.5 – Aquatics Resource
- Lewis River Side Channel Near Muddy River Instream Habitat Restoration: $42,000 from Fund 7.5 – Aquatics Resource

3.2.28 SA Section 8.1 Hatchery and Supplementation Program

On December 20, 2010, FERC issued an order approving the *Hatchery and Supplementation Plan,* which was originally submitted on December 23, 2009.

3.2.29 SA Section 8.2 Hatchery and Supplementation Plan and Report

PacifiCorp Energy and Cowlitz PUD provided a final version of the *2012 Annual Operating Plan* to the Hatchery and Supplementation subgroup on February 10, 2012. The final report of 2011 activities is included as an Appendix F within this ACC/TCC Annual Report.

3.2.30 SA Section 8.3 Anadromous Fish Hatchery Adult Ocean Recruit Target by Species

The December 2009 *Final Hatchery and Supplementation Plan* provided the methodology for determining ocean recruits for each species. No calculations of this metric were made in 2011 under the *Monitoring and Evaluation Plan* or Hatchery and Supplementation program as no reintroduction programs have been implemented.

3.2.31 SA Section 8.4 Anadromous Fish Hatchery Juvenile Production

PacifiCorp Energy and Cowlitz PUD funded the operation of the Lewis River Hatchery Complex to meet current FERC license obligations for anadromous fish production.

3.2.32 SA Section 8.5 Supplementation Program

The Supplementation Program is included in the *Hatchery and Supplementation Plan* submitted to FERC in December 2009.

3.2.33 SA Section 8.6 Resident Fish Production

PacifiCorp Energy and Cowlitz PUD funded the operation of the Lewis River Hatchery Complex to meet current FERC license obligations for resident fish production.

3.2.34 SA Section 8.7 Hatchery and Supplementation Facilities, Upgrades, and Maintenance

PacifiCorp Energy continued work towards completing conceptual and final designs and upgrades defined in Schedule 8.7. Activities in 2011 included:

- The rebuild of Pond 16 at Lewis River hatchery;
- Testing and inspection of the Lewis River upstream supply pipe; and
- Placement of the kokanee weir box at Speelyai hatchery.

3.2.35 SA Section 8.8 Juvenile Acclimation Sites

PacifiCorp Energy completed plant/animal, cultural and wetland specialist reports for the areas and the USDA-FS has reviewed these reports for inclusion in the NEPA analysis. A plan for the Crab Creek site continues to evolve and, as of the end of December, has not been completed. PacifiCorp Energy will continue to evaluate options for Crab Creek with the USDA-FS and the Lewis River ACC in 2012.

3.2.36 SA Section 9.1 Monitoring and Evaluation Plan

On March 31, 2010, PacifiCorp Energy provided a draft *Monitoring and Evaluation (M&E) Plan* to the ACC for review. After receiving comments, the M&E Plan was finalized and submitted to FERC on June 16, 2010. FERC approved the final plan on November 3, 2010.

3.2.37 SA Section 9.2 Monitoring and Evaluation Related to Fish Passage

Implementation of the M&E Plan will continue in 2012 since the Final Plan was approved by the FERC.

3.2.38 SA Section 9.3 Wild Fall Chinook and Chum

Implementation of the fall Chinook monitoring that includes chum will continue in 2012 per the M&E Plan approved by the FERC.

3.2.39 SA Section 9.4 Water Quality Monitoring

See section 4.1.2 under Water Quality

3.2.40 SA Section 9.5 Monitoring of Hatchery and Supplementation Program

FERC approval of the *Hatchery and Supplementation Plan* was provided on December 20, 2010. Certain components of the plan were implemented prior to the FERC approval to facilitate the reintroduction program beginning in 2012. These include the wild winter steelhead program and additional hatchery production of both coho and spring Chinook.

3.2.41 SA Section 9.6 Bull Trout Monitoring

PacifiCorp Energy, on behalf of the Utilities, completed actions according to the *2011 Annual Operating Plan*. Results from activities performed and data obtained under SA Section 4.9.2 are provided in Attachment D, *Lewis River Bull Trout 2011 Annual Report*.

3.2.42 SA Section 9.7 Resident Fish Assessment

Implementation of resident fish assessment will continue in 2012 per the M&E Plan as approved by the FERC.

3.2.43 SA Section 9.8 Monitoring of Flows

Monitoring of Merwin flows and the Upper Release and the Constructed Channel flows has occurred on a continuous basis and will continue per the M&E Plan.

3.3 Aquatic 2012 Annual Plan

3.3.2 SA Section 4.2 Merwin Trap

PacifiCorp Energy will continue to collaborate with WDFW and to the extent feasible, limit the discharge from the Merwin Powerhouse for safety purposes to a maximum of 5,500 cfs when personnel are working in the Merwin Trap.

3.3.3 SA Section 4.3 Merwin Upstream Collection and Transport Facility

A Merwin Upstream Collection and Transport Facility final design was submitted to the FERC in December 2009. PacifiCorp Energy awarded a contract for construction and work began in March 2011. At the same time, critical habitat for eulachon smelt was designated and has resulted in construction delays due to consultation needs. In addition, a cavity was discovered in the rock embankment under the Merwin Control Room that threatens the construction process and the existing powerhouse until a fix can be devised. This problem, along with eulachon consultation, has effectively delayed completion of the Merwin Upstream Facility for a year. The ACC was notified of this schedule change in the fall of 2011. The existing Merwin trap will continue to operate as is has until July 1, 2013 when it will be shut down for the final stages of construction of the new Merwin Upstream Facility.

3.3.4 SA Section 4.4 Downstream Transport at Swift No. 1 Dam

PacifiCorp Energy completed and submitted the final design for the Swift Downstream Facility in December 2009. PacifiCorp Energy has awarded a contract for construction and began the first construction phase in March 2011. PacifiCorp Energy completed activities related to the acquisition of land on which to site the downstream Release Pond. Final designs have been submitted to FERC. Construction of the Release Pond project is also subject to consultation on construction, operation and impacts to critical habitat for Eulachon smelt and will likely be delayed one year. PacifiCorp Energy will work with the ACC to devise a method of release for the downstream migrants in 2013 until the Release Pond is completed.

3.3.5 SA Section 4.9 Interim Bull Trout Collection and Transport

PacifiCorp Energy and Cowlitz PUD are to investigate alternative Bull Trout collection methods in consultation with ACC. The *Lewis River Bull Trout 2012 Annual Plan* (Attachment DC) has been incorporated into this Annual Report and submitted to members of the ACC including USFWS in February 2012.

3.3.6 SA Section 5.2 Bull Trout Habitat Enhancement Measures

PacifiCorp Energy will continue to manage the Cougar Creek Conservation Covenant and Cowlitz PUD will continue to manage the Devil's Backbone Conservation Covenant to benefit bull trout.

3.3.8 SA Section 5.7 Public Information Program to Protect Bull Trout

PacifiCorp Energy will continue to provide flyers with the same information at recreation park entrance booths. The Utilities will also provide such flyers to enforcement personnel for distribution.

3.3.9 SA Section 6.1 Flow Releases in the Bypass Reach; Constructed Channel

PacifiCorp Energy and Cowlitz PUD will adhere to the Swift bypass reach and constructed channel flow release schedule specified in the 401 Water Quality certifications.

3.3.10 SA Section 6.2 Flow Fluctuations below Merwin Dam

PacifiCorp Energy will continue to implement the operational flow regimes as identified in the SA and the Merwin FERC License.

3.3.11 SA Section 7.1 Large Woody Debris Project

PacifiCorp Energy will continue to maintain the available funds in a Tracking Account per the SA to help defray the costs of LWD transport.

3.3.12 SA Section 7.2 Spawning Gravel Study and Gravel Monitoring and Augmentation Plan

Periodic monitoring will continue pursuant to determining the need for gravel supplementation.

3.3.13 SA Section 7.4 Habitat Preparation Plan

The swift reservoir phase of the Habitat Preparation plan is now complete after the 2011 release. Releases of spring Chinook, early coho salmon and winter steelhead will now be directed by the Hatchery and Supplementation program as reintroduction of these species begins in 2012.

3.3.14 SA Section 7.5 Aquatics Fund

The Utilities will continue to implement actions per the *Aquatic Fund Strategic Plan and Administrative Procedures*. Attachment K provides a copy of recent Lewis River Aquatic Fund Projects (SA 7.5.3.2) Project Closeout Reports, which provides a summary of those aquatic fund projects completed as of December 31, 2011.

3.3.15 SA Section 8.2 Hatchery and Supplementation Plan

The Licensees will finalize the 2012 *Annual Operating Plan* and submit the final to the ACC in January 2012. In February 2012, the Licensees will issue a draft 2011 *Hatchery and Supplementation Annual Operating Report* to the ACC for a 60-day review period.

3.3.16 SA Section 8.3 Anadromous Fish Hatchery Adult Ocean Recruit Target by Species

The Licensees will continue to implement actions of the *Hatchery and Supplementation Plan* to achieve hatchery adult Chinook, steelhead, and coho ocean recruit targets (“Hatchery Targets”) as described in the SA.

3.3.17 SA Section 8.4 Anadromous Fish Hatchery Juvenile Production

Per the SA and the *Hatchery and Supplementation Plan*, the Licensees will provide for the production of spring Chinook salmon smolts, steelhead smolts, and coho salmon smolts at levels specified ("Juvenile Production").

3.3.18 SA Section 8.6 Resident Fish Production

Subject to Section 8.6.3, the Licensees will continue to provide for the production of 20,000 pounds of resident rainbow trout (to Swift reservoir) and 12,500 pounds of kokanee (to Merwin reservoir) each year following per the FERC licenses.

3.3.19 SA Section 8.7 Hatchery and Supplementation Facilities, Upgrades, and Maintenance

The Licensees will continue to implement hatchery facility upgrades in collaboration with the hatchery managers and hatchery engineers and in Consultation with the ACC. The current schedule for completing SA 8.7 upgrades is provided in Appendix A of the *Hatchery and Supplementation Program 2012 Annual Plan*¸ which can be found under Attachment E of this report. The schedule is subject to changes based on permitting and coordination with hatchery operations needs and timelines.

3.3.20 SA Section 8.8 Juvenile Acclimation Sites

The Acclimation Pond Plan is on hold pending NEPA procedures for construction on the Gifford-Pinchot National Forest Lands. In addition, PacifiCorp Energy is working with USFWS to determine the effects of pond construction in the Muddy River which is listed as bull trout critical habitat. The NEPA and ESA efforts may delay construction of the ponds if consultation and a FONSI are not completed in time to issue contracts and initiate construction in summer of 2012.

3.3.21 SA Section 9.6 Bull Trout Monitoring

The Licensees will continue to monitor and evaluate bull trout populations in the Lewis River basin following approval of the 2012 Bull Trout Annual Operating Plan (AOP). Overarching long-term bull trout monitoring objectives were included within the FERC approved M&E Plan. Specific monitoring tasks, including methods and locations, will continue to be developed and included within the bull trout AOP and submitted to the USFWS and ACC annually.

4.0 WATER QUALITY

4.1 PacifiCorp Energy Water Quality Measures Implemented in 2011

4.1.1 PacifiCorp Energy Application for 401 Water Quality Certificate for Yale, Swift No. 1 and Merwin Hydroelectric Projects

On October 9, 2006, Ecology provided 401 Water Quality certificates for the Merwin, Yale, and Swift No. 1 hydroelectric projects. These 401 Certifications have subsequently been amended several times. Until FERC issued licenses for the Lewis River Hydroelectric Project on June 26, 2008, PacifiCorp Energy implemented those measures contained in the 401 Certifications that were not FERC license-specific, and has implemented all the 401 requirements since June 26, 2008.

4.1.2 SA Section 9.4 Water Quality Monitoring

The following section covers water quality monitoring activities performed by PacifiCorp Energy in accordance with Ecology's Lewis River 401 water quality certifications. Some monitoring parameters are ongoing from previous years, such as Total Dissolved Gas (TDG) monitoring in Swift No. 1 and Yale tailraces, while other activities for example Merwin, Yale, and Swift forebay temperature profiles were implemented for the first time in 2007 and continued in 2011.

Per the 401 water quality certificates, monitoring of projects' spillway TDG levels continued through 2011. Tailrace TDG monitoring has been ongoing since 1995 and will continue per the direction of the 401 requirement. Until it is shown that a temperature issue does not exist, PacifiCorp Energy will also continue to monitor water temperature in the forebays and tailraces of each project and, in cooperation with Cowlitz PUD, monitor water temperature in the Swift Bypass Reach. A draft water quality management plan (WQMP) was completed and conveyed to Ecology in September 2008. Following consultation with Ecology and issuance of an amended order on June 22, 2009, version 2 of the WQMP was submitted to Ecology in September 2009. In December 2010, Ecology responded to the revised Plan and after a series of meetings and discussions, issued another amendment on November 7, 2011 which included revised provisions of Chapter 90.48 RCW and Chapter 173-201A WAC. Along with the amendments, Ecology requested PacifiCorp to modify this Plan to comply with the standards corrections and any other changes that are necessary based on the currently amended 401 WQ certifications. Pending Ecology approval of the WQMP, additional monitoring of water quality parameters is scheduled to occur in this revised Plan.

2011 Total Dissolved Gas Analysis for Yale, Swift No. 1 and Merwin Hydroelectric Project Spills

Upon issuance of the 401 water quality certificates, PacifiCorp Energy began monitoring of spillway TDG in the fall of 2006. Previous TDG monitoring sites near the Swift No. 1, Yale and Merwin spillways were reactivated at the beginning of the 2011 high run-off period and equipment was deployed at Swift and Yale projects. Merwin monitoring equipment was prepared but not deployed until just preceding any high flow event due to vandalism concerns.

On January 14-19, 2011, the Lewis River experienced a high flow event that reached 46,850 cubic-feet-per-second (cfs) inflows at Merwin dam. While this was not a particularly unusual winter flow, the event resulted in the Merwin Project spilling over 19,000 cfs (a daily average of 10,697 cfs) for approximately four days (Figure 4). The resultant total dissolved gas (TDG) levels exceeded 110 percent for most of the spill period. According to procedures defined in the Merwin 401 Certification, TDG monitoring continued for 48 hours following the termination of spill. The Yale project also spilled during this period.

Several other spill events occurred at the Merwin project that were primarily related to unit trips and resulting spill gate opening to maintain minimum flow. An example is shown in Figure 6 for an event that occurred in June 2011. A spill averaging 3,540 cfs occurred at the Yale project January 15 – 21, 2011 resulting from a high inflow event that peaked at about 38,000 cfs (Figure 7).

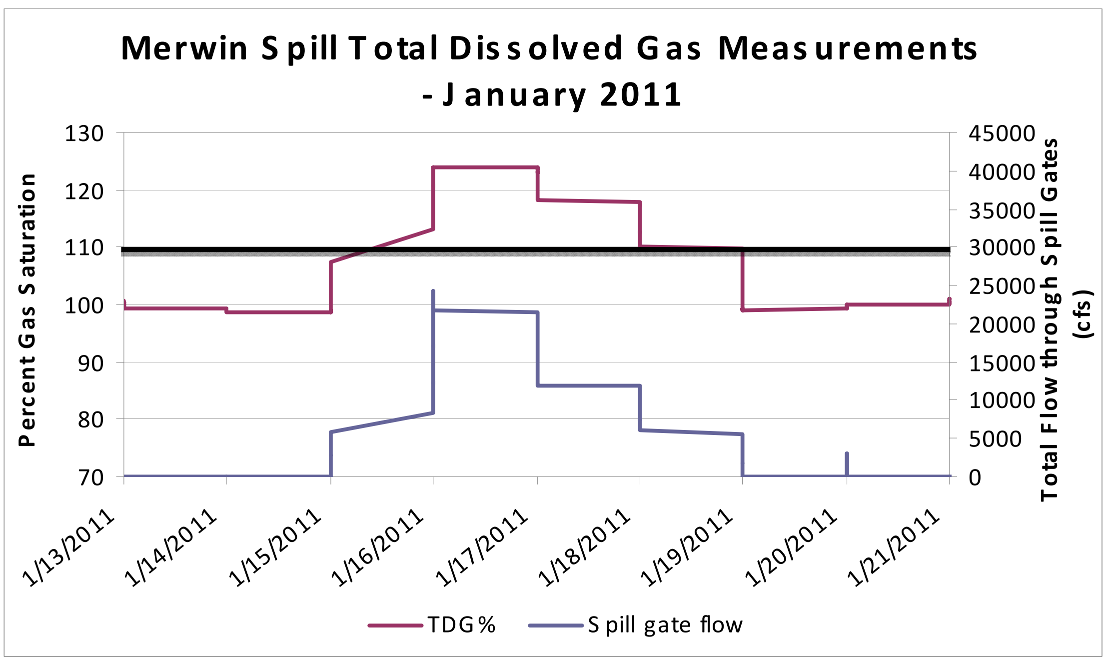

Figure 4. Merwin spill total dissolved gas measurements.

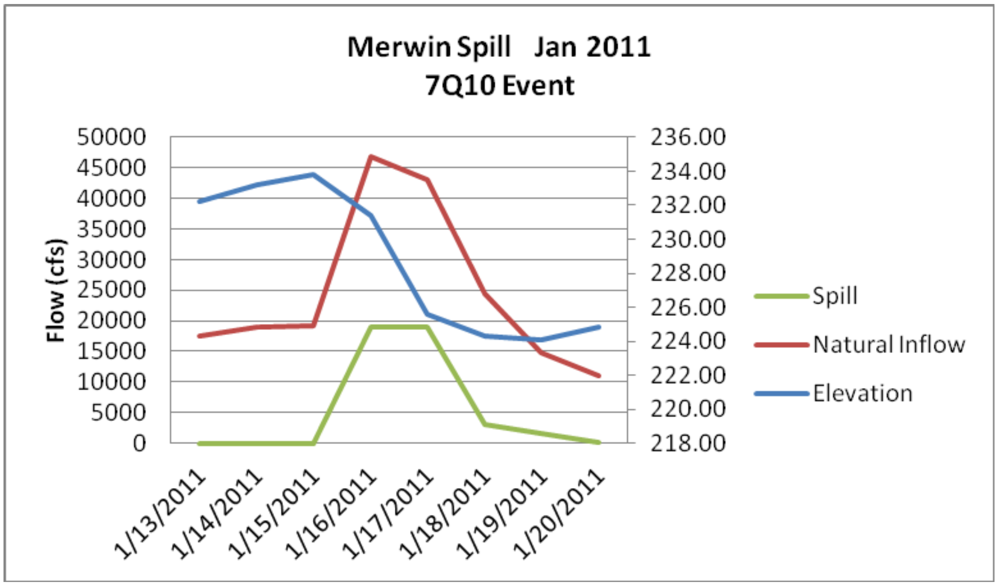

Figure 5. **Percent saturation of Total Dissolved Gas (TDG) during the January 2011 Merwin spill event.**

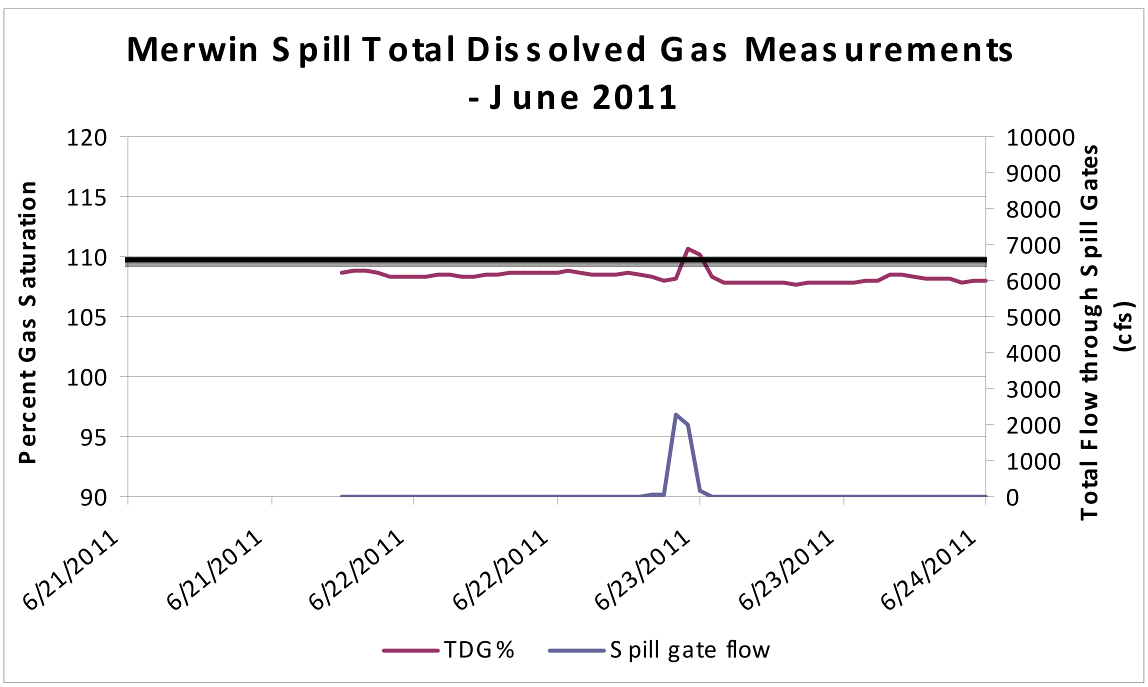

Figure 6. **Percent saturation of Total Dissolved Gas (TDG) during the June 2011 Merwin spill event.**

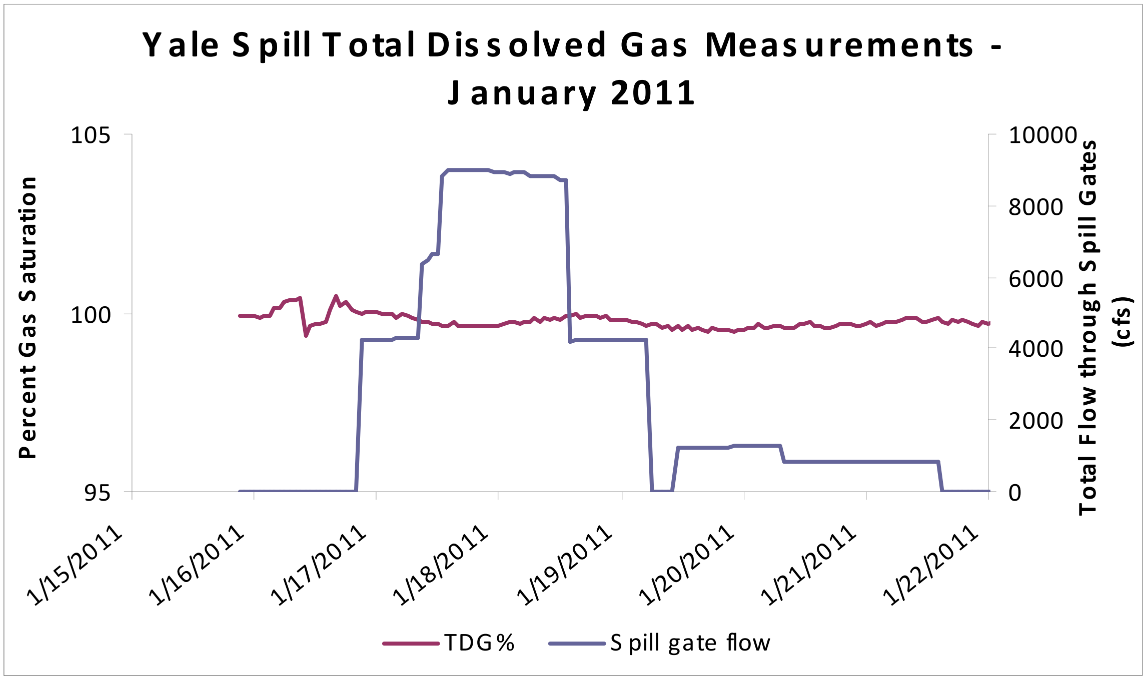

Figure 7. Percent saturation of Total Dissolved Gas (TDG) during the January 2011 Yale spill event.

Yale Tailrace TDG

Total dissolved gas data in the Yale tailrace (Attachment G) was gathered hourly in 2011 using a HydroLab Series 5 miniSonde (MS5). A stainless steel tube is permanently attached to the Yale powerhouse wall and is submerged to a depth of 15 feet. The HydroLab is deployed within this tube to protect the probe and maintain consistent depth at 15 feet. In 2011, 7,120 data points were recorded in the Yale tailrace. Of those data points, none were found to exceed the state standard of 110 percent. During the period of July 2 through September 10, 2011, the probe housed within the steel tube experienced a malfunction in which TDG spiked to levels as high as 144 percent of saturation within the tube. These data were verified with a portable unit and found to be erroneous outside of the tube. It was later discovered that within the tube, dissolved gas readings were excessively high and not indicative of ambient tailwater conditions. To determine the cause of this, PacifiCorp contracted with Advanced American Diving to inspect and clean the steel tube. Upon inspection, moderate corrosion was observed as well as significant aquatic vegetation growth inside and outside the underwater portion of the pipe. The divers cleaned the inside and outside of the pipe with a high pressure water jet and we reinstalled the probe on September 10, 2011. This remedied the problem as total dissolved gas levels stabilized and returned to normal levels (less than 110% of saturation).

During 2011, PacifiCorp Energy continued evaluating measures at the Yale tailrace to control TDG during motoring operations. These measures include automated "flushing" of the tailrace periodically. Flushing is defined as ramping one unit to 5 MW for ten minutes. The frequency of this event depends on real-time dissolved gas measured in the tailrace with the MS5 and is fully automated through the Programmable Logic Control (PLC). This measure was first implemented on October 20, 2007 and continues to be an effective procedure in reducing TDG levels in the Yale tailwaters.

In addition to the flushing flows, automated air valves have been in place since 2009, to limit the volume of air entering the turbine throughout the operating range of each unit. This investment provides control of excessive TDG in the Yale tailwaters during normal operations of the units.

In 2012, PacifiCorp will initiate a redirection or dispersion of the cooling water outflow in the tailrace to determine the influence of cooling water discharge on TDG.

Swift No. 1 Tailrace TDG

TDG data (Attachment H) was gathered hourly in the Swift No. 1 tailrace using two HydroLab Series 5 miniSondes (MS5). The second meter is used for comparison and quality control as well as determining if differences in TDG exist based on individual unit operation. Similar to the Yale tailrace, meters are deployed within steel tubes permanently attached to the powerhouse wall. Meter No. 1 is located between the draft tubes of Units 11 and 12 while Meter No. 2 is located between the draft tubes of Units 12 and 13. The meters gather data hourly from a water depth of 15 feet. An average of data from each meter is provided in graphic form (Attachment H). Of the 8,727 data points collected, 0.05 percent were greater than the 110 percent TDG State Standard, a substantial decrease from the previous year's 0.7 percent. Similar to Yale tailrace, data points greater than 110 percent can be produced during times of project motoring operation. During times of normal generation, elevated levels of TDG are not typically observed.

To reduce TDG within Swift No. 1 tailrace during periods of normal generation and load following operations, air intake modifications and automation were made in 2005 that limit the volume of air entering the units over their generation range based on a predefined air volume curve. This measure, while effective at normal generation levels, is not effective during periods of motoring. If flushing procedures currently being evaluated at Yale continue to be effective, then this procedure will also be implemented at Swift No. 1 in 2012 to help alleviate remaining TDG issues.

Swift No. 1 Forebay TDG

TDG data (Attachment H) was gathered hourly in the Swift No. 1 forebay from February 7, 2008 to May 31, 2008, using a HydroLab Series 5 datasonde (DS5). The meter was deployed to a water depth of 15 feet from the dam intake deck via steel cable. During the period, 2,747 data points were recorded. Of those data points, none were found to exceed 110 percent TDG saturation. Based on Table 2 in section 4.8 of the 401 water quality certification for the Swift No. 1 hydroelectric facility, TDG monitoring in the project forebay is "Ongoing if exceedances occur until three months after such exceedances are corrected". No exceedances were recorded in the four-month monitoring period for the Swift No. 1 forebay, therefore monitoring activities were suspended on May 31, 2008.

2011 Temperature Profiles for Merwin, Yale, and Swift No. 1 Forebays and Corresponding Temperature Comparison between Forebay Intake Depth and Tailrace For Each Project

Graphs representing forebay temperature profiles from the surface to reservoir bottom and graphs comparing forebay intake depth temperatures to the tailrace temperatures for Merwin, Yale, and Swift No. 1 in 2011 are included in Attachments G, H and I, respectively. Data points for forebay temperature profiles are two-week averages of hourly temperature readings taken at each specified depth. Data points for intake depth/tailrace comparison were taken hourly from a depth of 15 feet in project tailraces, and specified intake depth in project forebays, hourly data was then converted to seven-day averages of the daily maximum temperature (7DADmax). Temperature data was gathered using Onset Tidbit v2 Temp Loggers®. Prior to deployment, each temperature thermograph was verified and calibrated using a National Institute of Standards and Technology (NIST) certified reference thermometer.

Yale

Temperature stratification was observed in the Yale Reservoir forebay for the entire data gathering time-frame, May 1, 2011 through October 31, 2011 (Attachment G). The forebay from the surface to a depth of 60 feet down was isothermal during the October sampling period though stratification still occurred in depths below 60 feet. The coldest two-week average temperature recorded during the analysis was 5.4°C at 100 foot depth and was observed in May. The warmest two-week average temperature was 20.4°C near the surface during August.

The Yale tailrace/forebay intake depth 7DADmax temperature graphs are depicted in Attachment G. The tailrace water temperature is comparable to the forebay intake depth temperature when operations are stable. During times when the units are offline or motoring the tailrace temperature deviates from the intake depth due to Merwin Reservoir water backing up into the tailrace and turbine cooling water being discharged near the datasonde probe, this results in minimal correlation between the tailrace temperature and forebay intake depth temperature during times of project motoring or non-operation.

Swift No. 1

Temperature stratification was observed in Swift No. 1 forebay for the entire period of analysis May through October 2011 (Attachment H). The warmest two-week average temperature, 19.7°C, was observed in August on the reservoir surface. The coldest observed temperature during the period of analysis was 5.1°C and was recorded at a depth of 60 feet in May. Construction, consisting of piling being driven into the reservoir bottom in the vicinity of the Swift No. 1 forebay, took place during the entire water temperature data gathering time-frame in 2011. This close proximity construction work necessitated large periods of time when the temperature thermistors had to be removed from the sampling site due to conflicts of space. The close proximity of the boring activities in 2011 may have also influenced temperatures recorded in the forebay. Many of the Swift No. 1 forebay temperature profiles recorded during 2011 did not correlate with historical data gathered during times when there were no pile-boring activities occurring in the area.

As in the Yale Project, hourly temperature readings were taken from the Swift No. 1 tailrace from a depth of 15 feet using HydroLab Series 5 miniSonde. Hourly temperatures were then converted to 7DADmax readings in order to get an intake depth temperature to tailrace temperature comparison per the direction of the 401 certification (Attachment H). Many different environmental factors apart from the construction work in the vicinity also influenced the intake depth to tailrace water temperature comparison, namely; reservoir elevations, powerhouse operations, configuration of the water withdrawal system, and placement of the forebay thermistors.

The bathymetry of Swift Reservoir in the vicinity of the penstock intakes is unusual in that instead of the entrance of the intakes just lying on the reservoir bottom drawing water from all angles, they are at the downstream end of a deep trench that was notched into the hillside during construction of the dam. This deep, narrow trench influences the mixing of stratified water as it is entrained into the intakes. It is difficult to deploy thermographs that will stay stationary and lined up with the intakes in the center of this trench as they are affixed to the floating forebay log-boom that moves in and out with fluctuating reservoir levels and wind.

Because of the movement of the forebay meters and supposed influence of construction activities it was difficult during the 2011 monitoring season to get a direct correlation of the intake depth forebay thermograph to the corresponding tailrace thermograph (Attachment H). Care will be taken in 2012 to investigate means of keeping the forebay thermograph profile string more stable and in greater alignment with the project intakes.

Boring activities in the forebay vicinity were completed in December 2011, thus should not be a factor during 2012 data gathering activities.

Other deviations between forebay intake depth to tailrace temperatures occurred when the powerhouse was offline or during project motoring operations.

Merwin

As in prior years, temperature stratification was observed in Merwin Reservoir from May through October 2011, with the reservoir getting progressively warmer until turn-over in the latter half of October, whereas the forebay became nearly isothermal for the remainder of data gathering activities (Attachment I). The coldest two-week temperature average (5.7° C) was recorded in May at intake depth of 178.5 feet. The warmest two-week average temperatures were observed at the reservoir surface in August and were 20.5°C. Since PacifiCorp Energy considers the reservoir conditions as baseline, there were no observed temperature exceedances for Merwin Reservoir in 2011.

An Onset Tidbit v2 Temp Logger® temperature recorder was positioned within the Merwin tailrace at a depth of approximately 15 feet and hourly temperature recordings were taken for the duration of 2011 (Attachment I). Hourly readings were converted to seven-day averages of the daily maximum temperature (7DADmax) and during the January 1, 2011 through June 15, 2011 time period, twenty-six 7DADmax data points were recorded and zero were observed to be greater than 13° C. During June 16, 2011 through August 31, 2011 time period, seven 7DADmax data points were recorded and zero were observed to be greater than 16° C. The temperature thermistor was unknowingly taken from the water during this time-period for seven weeks by a contractor working on the Merwin fish trap upgrade project. After this was identified, the thermistor was immediately returned to the tailrace and continued to gather data.

During the September 1, 2011 through December 31, 2011 time period, sixteen 7DADmax data points have been recorded. Of these, nine were observed to be greater than 13° C (Attachment I). 7DADmax temperatures over 13° C were first observed in the project tailrace during the third week of September and persisted until the second week of November. PacifiCorp Energy will continue to monitor this condition through the pending Water Quality Temperature Attainment Plan (WQTAP).

2011 Dissolved Oxygen Comparison between Merwin Forebay Intake Depth and Merwin Tailrace in September and October

Hourly dissolved oxygen levels in milligrams per liter (mg/l) were measured in the Merwin forebay at an approximate depth of 160 feet during September through October 2011 and in Merwin tailrace at an approximate depth of 15 feet during September through October 2011 (Attachment I). Measurements in the forebay were recorded with a HydroLab Series 5 datasonde (DS5) and with a HydroLab Series 5 miniSonde (MS5) in the project tailrace (Attachment I). Due to a malfunction within the DS5, dissolved oxygen readings from Merwin forebay were lost from September 1 through September 14, 2011. Once identified, this problem was soon remedied and the datasonde continued to collect data.

During the period of analysis, 1,141 data points were recorded in the project forebay. Since PacifiCorp Energy considers reservoir conditions as baseline, there were no recorded deviations from the State Standard. 1,288 corresponding dissolved oxygen data points were recorded in the Merwin tailrace (Attachment I). Of these data points, 816 (or 63.4 percent of the total) were less than 9.5 mg/l. The minimum dissolved oxygen level observed in Merwin forebay was on October 24, 2011, and recorded 7.2 mg/l. The minimum dissolved oxygen level observed in Merwin tailrace was on October 19 and recorded 8.13 mg/l.

2011 Temperature Comparison in the Swift Bypass Reach between Waters Upstream and Downstream of the mouth of Ole Creek

In 2011, 17,520 hourly temperature readings were taken from 50 feet upstream and 50 feet downstream of the Ole Creek confluence with the Swift Bypass Reach and converted to 7DADmax values (Attachment H). Temperatures were recorded using Onset Tidbit v2 Temp Loggers®. Swift Bypass Reach 7DADmax temperatures upstream of Ole Creek as compared to downstream of Ole Creek were observed to correlate throughout the period of analysis except for slight deviations from May through July and again in November through December when upstream temperatures were minimally warmer. From August to November, there was little or no deviation. It is interesting to note that the fall season flows from Ole Creek appear to be significant enough to influence the bypass reach temperature.

4.2 PacifiCorp Energy Water Quality 2012 Annual Plan

PacifiCorp Energy will implement the following water quality measures in 2012.

4.2.1 Water Quality Management Plan

Implement an Ecology-approved Water Quality Management Plan (WQMP) describing how PacifiCorp Energy will meet the terms of the 401 Water Quality Certificate. PacifiCorp is currently working with Ecology on an updated WQMP following a 401 amendment process initiated by Ecology in 2010. A final document is expected in 2012.

4.2.2 Flow Monitoring

PacifiCorp Energy will continue to monitor flows in the Swift bypass reach (Upper Release flow and Constructed Channel flow) and downstream of Merwin dam.

4.2.3 Bypass Reach Gravel Replacement

PacifiCorp Energy will monitor the gravel placements sites to determine distribution of gravel if spill from Swift dam exceeds 5,000 cfs.

4.2.4 Yale Tailrace Temperature Attainment Plan

Implement Yale Tailrace Temperature attainment plan as proposed in the draft WQMP when approved by Ecology.

4.2.5 Swift and Merwin Spill TDG Attainment Plan

Implement Merwin Spill TDG Attainment Plan as proposed in the draft WQMP when approved by Ecology.

4.2.6 Lewis River Project Temperature Model

Implement the Lewis River Temperature Model as proposed in the draft WQMP if approved by Ecology.

4.2.7 Yale-Swift Turbine TDG Attainment Plan

Continue implementation of Turbine TDG attainment plan for the Yale and Swift projects. A copy of the attainment plan is included in the draft WQMP.

4.3 Cowlitz PUD Water Quality Measures Implemented as of the End of 2011

On October 9, 2006, Ecology issued a Clean Water Act Section 401 Certification (Order No. 3676) to Cowlitz PUD for the continued operation of the Swift No. 2 Hydroelectric Project under a new FERC license (Ecology 2006). The Section 401 Certification includes a number of conditions and general requirements directing Cowlitz PUD to comply with applicable water quality standards codified in 173-201A WAC.

On November 3, 2006, Ecology issued an Amendment Order (No. 3927)[1] addressing the potential for elevated TDG resulting from operation of the Swift No. 2 Surge Arresting Structure (SAS). On December 21, 2007 and January 17, 2008, Ecology issued the second and third amendment orders, 4998[2] and 5331, respectively[3].

In the spring of 2011, Cowlitz PUD and PacifiCorp Energy filed their *2010 Annual Report, Annual Summary of License Implementation and Compliance: Aquatic and Terrestrial Resources* (2010 Annual Report) (PacifiCorp Energy and Cowlitz PUD 2011). The 2010 Annual Report described Cowlitz PUD's water temperature and water quality monitoring activities completed in 2007, 2008, 2009, and 2010 in addition to other information required under Section 14.2.6 of the Settlement Agreement (PacifiCorp and Cowlitz PUD 2004) and the Section 401 Water Quality Certifications.

This section of the 2011 Annual Report describes Cowlitz PUD's water temperature, dissolved oxygen (DO), and hydrogen ion concentration (pH) monitoring activities completed in 2011 (as required under the Settlement Agreement and amended Section 401 Certification) (PacifiCorp and Cowlitz PUD 2004). Additional Settlement Agreement and amended Section 401 Certification requirements relating to instream flows, the constructed channel, gravel augmentation, salmonid monitoring, and water temperature monitoring in the Lewis River bypass reach are implemented together with PacifiCorp Energy.

4.3.1 Swift No. 2 Project Water Temperature Monitoring

Objective
As described in Cowlitz PUD's approved Forebay Water Temperature Monitoring Plan (Cowlitz PUD 2007), the overall objective of Ecology's water temperature monitoring requirement is to ensure the Swift No. 2 Project will not cause any violation of the state water temperature standards. Under the revised 2006 standards, the temperature criterion for the Swift No. 2 Project canal and forebay are subject to Core Summer Salmonid Habitat criteria (i.e., water temperatures are not to exceed a 7-DADMax of 16.0ºC) (Ecology 2008; Cowlitz PUD 2009).

[1] http://www.ecy.wa.gov/programs/WQ/ferc/existingcerts/order3927.pdf
[2] http://www.ecy.wa.gov/PROGRAMS/wq/ferc/existingcerts/swift2amend2.pdf
[3] http://www.ecy.wa.gov/PROGRAMS/wq/ferc/existingcerts/swift2amend3.pdf

Specifically, the amended Section 401 Certification requires Cowlitz PUD to monitor water temperatures in the Swift No. 2 canal and forebay during both 2007 and 2008 throughout the expected hottest, clear, sunny, calm periods of the year when Swift No. 1 and Swift No. 2 projects are off-line for at least 48 hours. If at least five off-line periods do not occur during one of these years, monitoring would continue past the second year for a total of 10 sampling periods. If water temperature exceedances are found during monitoring, Cowlitz PUD is further required to develop a Temperature Water Quality Attainment Plan (TWQAP). This plan would provide a detailed strategy for maintaining the highest attainable water quality condition to best protect the biota with respect to temperature that is feasible (Ecology 2006).

Water temperature monitoring data presented in the 2010 Annual Report showed that water temperatures recorded at the Swift No. 2 Project log boom and forebay sites did not exceed the 16.0°C 7-DADMax water temperature criteria at any depth interval during the 2007, 2008, 2009, and 2010 monitoring periods and overall, protected Core Summer Salmonid Habitat (PacifiCorp Energy and Cowlitz PUD 2010). However, because there were only a total of six qualifying periods between 2007 and 2009, Cowlitz PUD monitored water temperatures at both the log boom and forebay sites in 2011. Unless otherwise directed by Ecology, Cowlitz PUD plans to continue to monitor water temperatures at both the log boom and forebay sites in 2012 when it is expected that a total of ten qualifying periods will have been monitored.

This section of the report describes the results of Cowlitz PUD's water temperature monitoring at the log boom and forebay sites during the summer of 2011.

Methods

As in 2007, 2008, 2009, and 2010 water temperatures at the Swift No. 2 Project were monitored at two sites during the summer of 2011. One site was at the transition structure log boom[4] located approximately one mile upstream of the Swift No. 2 forebay (Figure 8) and the other was at the Swift No. 2 forebay (adjacent to the Project intake) (Figure 9). At both sites, seven Onset Stowaway TidbiT® thermographs were suspended from floating buoys at >1, 3, 6, 10, 15, 20, and 25-foot depth intervals along a weighted galvanized steel chain. Each thermograph was programmed to record water temperature at one-hour intervals.

[4] The transition structure is the section of the canal where the lining transitions from earth to rock/gravel to concrete.

Figure 8. The Swift No. 2 project Transition Structure log boom water temperature monitoring site.

Sampling bias was minimized at both sites by following the general thermograph deployment procedures described in *Continuous Temperature Sampling Protocols for the Environmental Monitoring and Trends Section* (Ward 2003). These procedures specify site selection and deployment methods designed to ensure that the thermograph results are representative of the sampling area throughout the entire deployment period. Concurrent with water temperature monitoring, Cowlitz PUD's SCADA system continuously recorded hourly generation at the Project's powerhouse.

All thermographs were downloaded and serviced approximately once every four weeks during the monitoring period to minimize the potential of data gaps due to instrument loss or malfunction. Prior to downloading, the thermographs were gently cleaned to remove any biofouling or sediment that would potentially affect their ability to communicate optically during the downloading process.

Figure 9. The Swift No. 2 project forebay water temperature monitoring site.

The Onset Corporation Stowaway TidbiT® thermographs used in this monitoring program have an accuracy of 0.2°C and a resolution of 0.16°C. All 14 thermographs used in the program were evaluated for accuracy during both pre-deployment and post-deployment calibration checks (Attachment L: Cowlitz PUD Appendices, Appendix A). During the pre-deployment calibration check, any thermograph with a mean absolute value difference beyond 0.2°C from a NIST Certified Reference Thermometer would have been rejected until the problem had been corrected and the thermograph passed another calibration check. If a thermograph failed a post-sampling calibration check, then another calibration check would have been performed. If it failed a second calibration check, the raw data would have been adjusted by the mean difference of the pre-and post-calibration check results to correct for the instrument bias (Ward 2003). As in 2007, 2008, 2009, and 2010, all thermographs used in the 2011 monitoring program passed their pre-and post-calibration checks (i.e. average absolute value differences were less than 0.2°C of the NIST Certified Reference Thermometer).

Prior to beginning the process to program a thermograph, the desktop computer clock and the watch used to record field deployment times were set to atomic clock time for the Pacific Time Zone. During the thermograph deployment process, all field data including station number, station name, thermograph ID numbers, and air and water temperature measurements obtained with a thermometer were recorded in a field notebook.

As in past years, all downloaded water temperature data collected in 2010 were processed through a quality assurance/quality control (QA/QC) procedure and were reviewed for any anomalous patterns or uncharacteristic spikes that could indicate a malfunction or dewatered instrument (Attachment L: Cowlitz PUD Appendices, Appendix A). Data that appeared suspicious were flagged and not used in subsequent analyses. Hourly temperature files were then analyzed to determine daily and monthly maximum, mean, and minimum temperatures.

In addition, data were expressed as 7-DADMax values (a requirement of the water quality standards for water temperature data) and graphed to facilitate a comparison with Project generation data (i.e. to determine the number of off-line periods greater than 48 consecutive hours). The 7-DADMax for any individual day is calculated by averaging that day's daily maximum temperature with the daily maximum temperatures of the three days prior to, and the three days after, that date. Forebay water temperature data were also compared with data collected at the transition structure log boom to evaluate any longitudinal warming in the canal.

Results and Discussion

Cowlitz PUD monitored water temperatures at the log boom and forebay sites from June 1 through September 9, 2011. In 2011, the hourly water temperature data were 99.9% complete at the log boom site and 99.9% complete at the forebay site. One data gap occurred at both sites during a thermograph cleaning and downloading event.

In 2011, there were no qualifying periods when the Swift No. 1 and Swift No. 2 projects were off-line for greater than 48 consecutive hours. The highest 7-DADMax water temperature recorded during the 2011 monitoring period was 12.9°C (at the log boom site at the >1-foot depth interval) (Table 5, Figure 10 and Figure 11). None of the 7-DADMax water temperatures recorded in 2011 at either site exceeded the 16.0ºC criteria for Core Summer Salmonid Habitat.

Depth Interval	Highest 7-DADMax Water Temperature Recorded at the Log Boom Site (°C)	Highest 7-DADMax Water Temperature Recorded at Forebay Site (°C)
>1	12.9	12.8
3	12.6	12.8
6	12.5	12.8
10	12.2	12.5
15	12.2	12.4
20	12.1	12.4
25	12.4	12.4

Table 5. The annual highest 7-DADMax water temperature recorded at each depth interval at the log boom and forebay sites during the 2011 monitoring period.

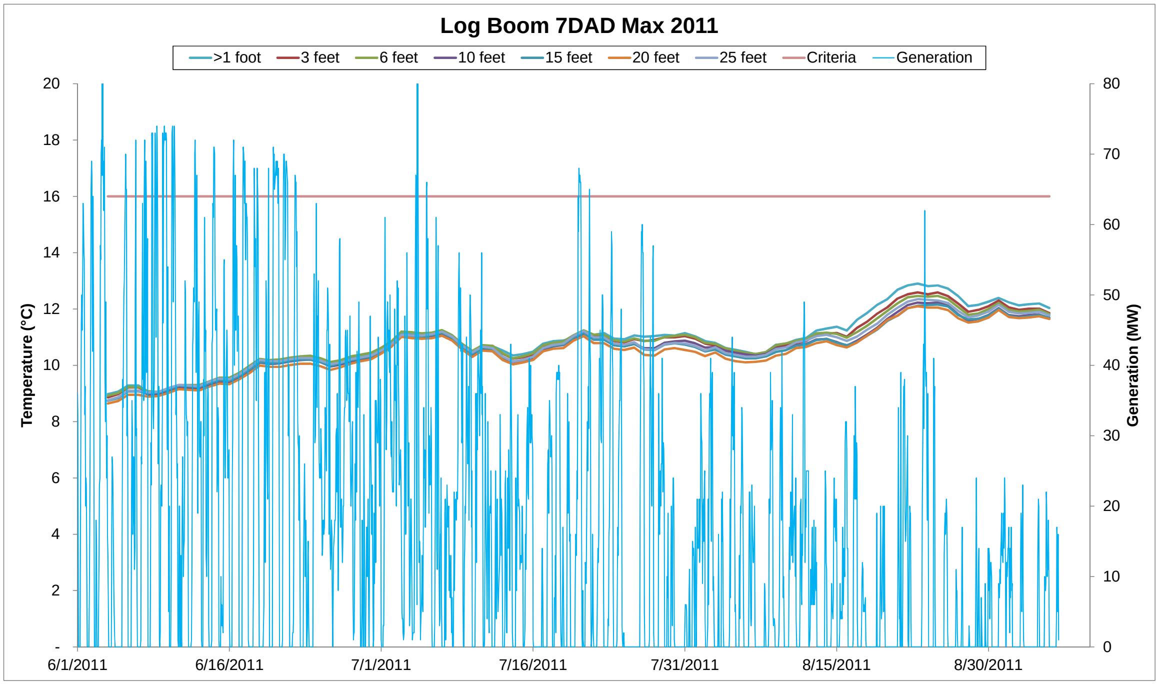

Figure 10. 7-DADMax water temperatures recorded at each depth interval at the log boom site during the 2011 monitoring period.

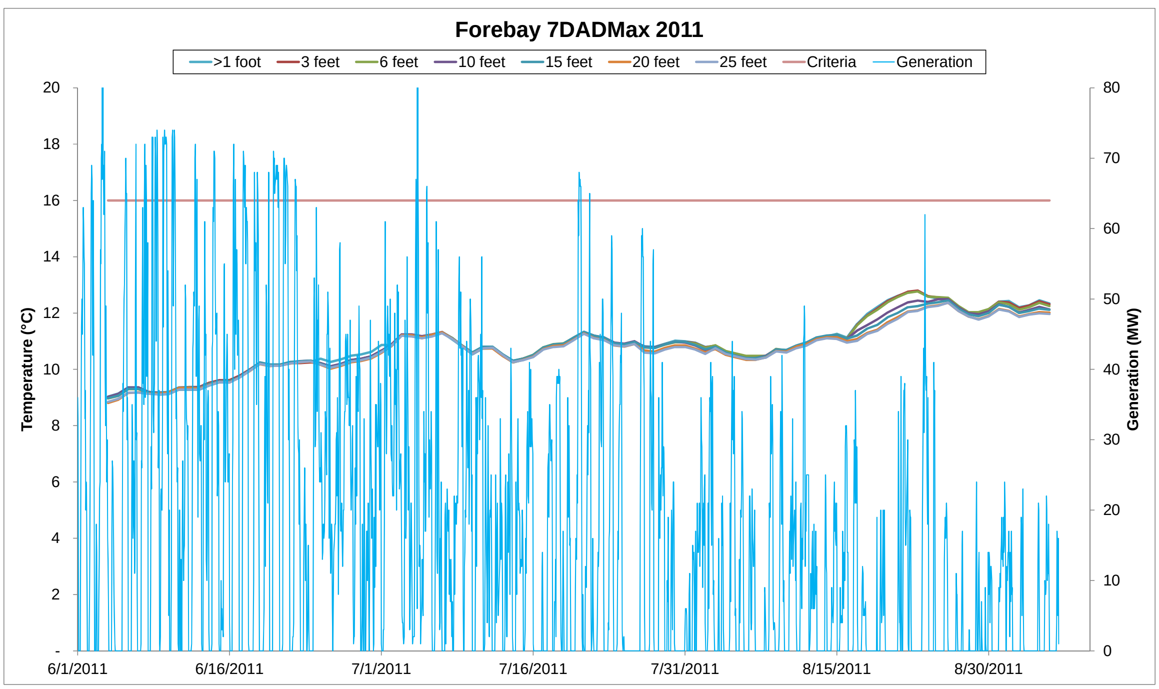

Figure 11. 7-DADMax water temperatures recorded at each depth interval at the forebay site during the 2011 monitoring period.

The monthly mean and maximum water temperature statistics for each site at each depth interval recorded during the 2011 monitoring period are reported in Table 6. The hourly water temperature regimes for each monitoring site and depth interval are presented in Figure 12 and Figure 13.

In 2011, the highest <u>hourly</u> water temperature recorded was 14.1C° at the forebay site on September 3 at the >1-foot depth interval (Table 6). The highest hourly water temperature recorded at the log boom site was 13.8°C on August 23 (Table 6).

Table 6. The monthly mean and maximum hourly water temperatures recorded at the log boom and forebay sites at each depth interval (June 10 through September 14, 2010).

Month	Depth	Mean Forebay Water Temp (°C)	Max Forebay Water Temp (°C)	Mean Log Boom Water Temp (°C)	Max Log Boom Water Temp (°C)
June	>1	8.8	11.0	8.9	11.9
	3	8.8	11.0	8.9	11.1
	6	8.9	11.2	8.9	11.1
	10	8.8	11.0	8.9	11.1
	15	8.8	11.0	8.9	11.2
	20	8.7	10.8	8.9	11.1
	25	8.8	11.1	8.9	11.2
July	>1	9.6	12.2	9.7	12.2
	3	9.5	12.2	9.7	12.2
	6	9.6	12.3	9.7	12.2
	10	9.4	12.3	9.7	12.2
	15	3.3	12.3	9.7	12.3
	20	9.2	12.1	9.6	12.2
	25	9.4	12.3	9.6	12.1
Aug	>1	10.5	13.7	10.6	13.5
	3	10.4	13.6	10.5	13.6
	6	10.4	13.8	10.5	13.6
	10	10.2	13.6	10.5	13.6
	15	10.1	13.6	10.4	13.7
	20	10.1	13.5	10.4	13.6
	25	10.2	13.7	10.4	13.5
Sept	>1	11.0	13.3	11.2	14.1
	3	11.0	13.3	11.2	13.9
	6	11.0	13.2	11.2	13.8
	10	10.8	13.0	11.2	13.4
	15	10.8	13.0	11.1	13.5
	20	10.8	13.1	11.0	13.1
	25	10.9	13.1	11.0	13.0

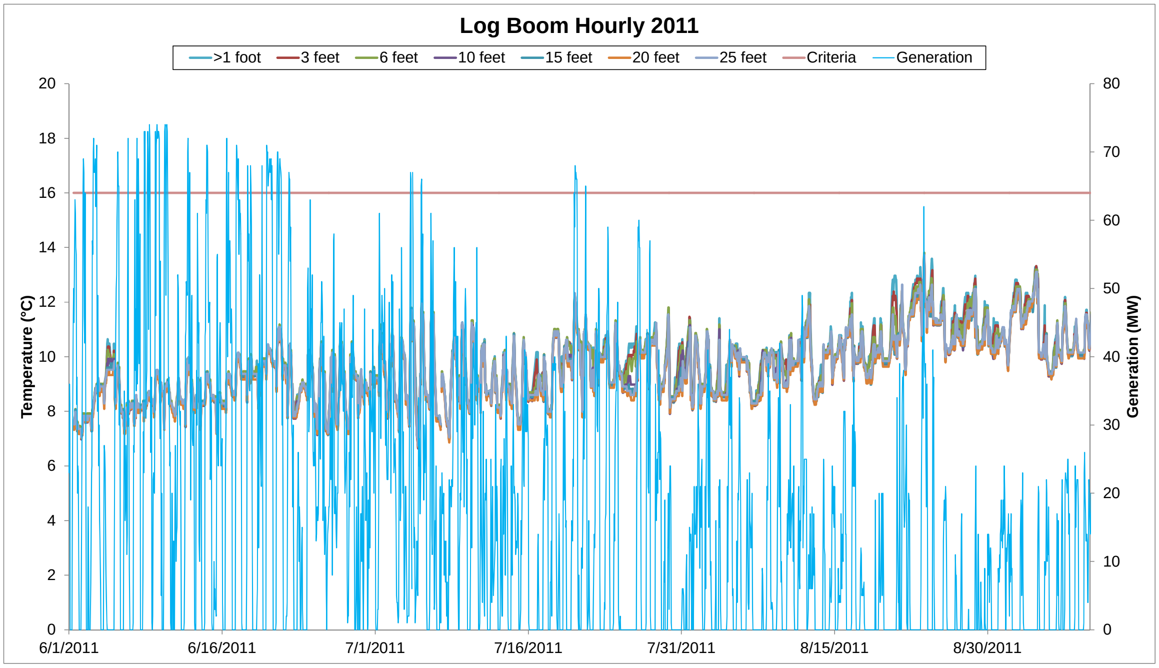

Figure 12. Hourly water temperatures recorded at each depth interval at the log boom site during the 2011 monitoring period.

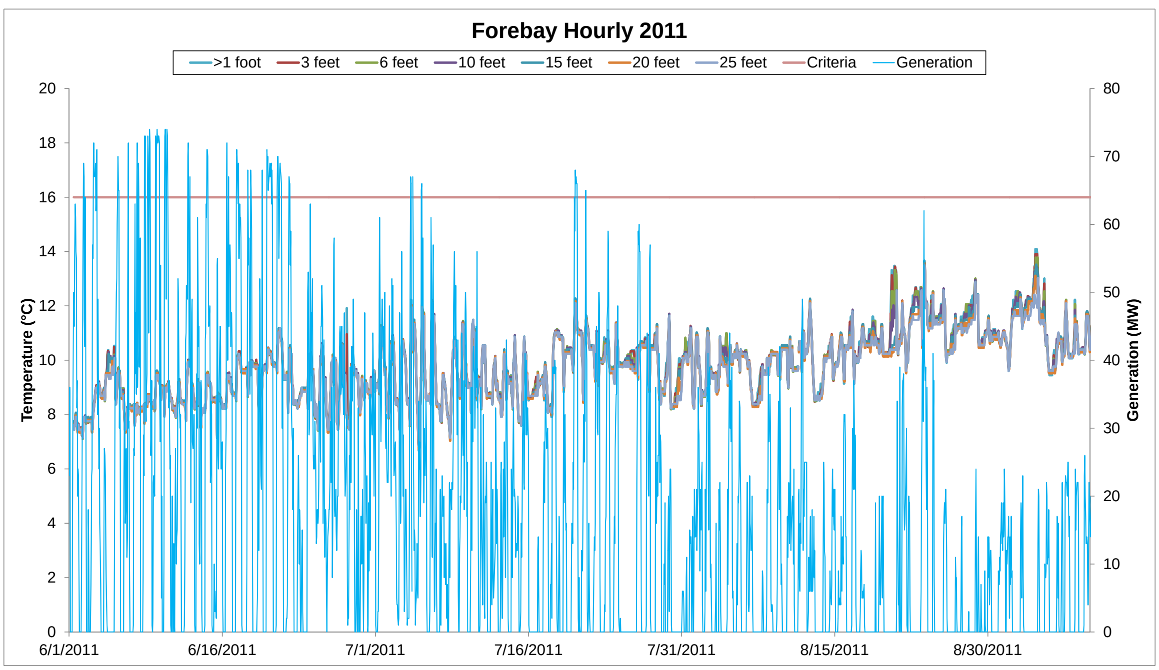

Figure 13. Hourly water temperatures recorded at each depth interval at the forebay site during the 2011 monitoring period.

Conclusion

Water temperatures did not exceed the 16.0°C 7-DADMax water temperature criteria at any depth interval at the log boom or forebay sites during the 2011 monitoring period; and overall, the results of monitoring to date indicate that water temperature conditions in the Swift No. 2 canal and forebay continue to protect Core Summer Salmonid Habitat.

Future Water Temperature Monitoring Activities

As illustrated in Table 7, during the 2007, 2008, 2009, 2010, and 2011 forebay and log boom water temperature monitoring periods, there have been a total of nine qualifying periods when the Swift No. 1 and Swift No. 2 projects were off-line for ≥ 48 consecutive hours. Cowlitz PUD will monitor water temperature at both the log boom and forebay sites during 2012, unless otherwise directed by Ecology.

Table 7. Total number of qualifying periods when the Swift No. 1 and Swift No. 2 projects were off-line for ≥48 consecutive hours during the 2007, 2008, 2009, 2010, and 2011 monitoring periods.

Year	Qualifying Off-line Periods
2007	3
2008	0
2009	3
2010	3
2011	0
Total	**9**

4.3.2 Swift No. 2 Project Tailrace Water Quality Monitoring

Objective

In its *Draft Water Quality Assessment and Management Plan* (Cowlitz PUD 2004) and in its *2007 Annual Summary of Settlement Agreement Implementation: Aquatic and Terrestrial Resources* (PacifiCorp Energy and Cowlitz PUD 2008), Cowlitz PUD committed to installing water quality monitoring equipment in the Swift No. 2 Powerhouse and to continuously record water temperature, DO, and pH in the Project tailrace. The overall objective of this long-term monitoring program was to evaluate how Swift No. 2 Project operations may influence water quality conditions in the tailrace and in the upper end of Yale Lake.

Methods

Cowlitz PUD installed and began monitoring water temperature, DO, and pH in the Swift No. 2 Project tailrace using a Hach/Hydrolab MiniSonde® 5 multiprobe (MS5) in March of 2009. Water temperature was measured using the standard Hach/Hydrolab 30k ohm variable resistance thermistor (accuracy of ±0.1°C), DO was measured using the EPA recommended Hach/Hydrolab Luminescence Dissolved Oxygen (LDO) sensor (accuracy of ±0.1 up to 8 mg/L and ±0.2 above 8 mg/L)[5], and pH was measured using the standard Hach/Hydrolab glass bulb pH sensor (+/- 0.2 units).

Prior to being deployed, the temperature, DO, and pH sensors on two different MS5s (a primary and backup multiprobe) were calibrated according to the manufacturer's recommended protocol. A paired meter test was also conducted prior to deployment to ensure the multiprobes were meeting measurement quality objectives. Paired multiprobe DO readings had a target accuracy of ± 0.2 mg/l, paired water temperature readings had a target accuracy of ±0.5°C, and paired pH readings had a target accuracy of ± 0.2 units. In 2010, both multiprobes (both the primary and backup) recorded values that fell well within the above targets.

Following calibration, a single MS5 was set to real time and programmed to measure and log data on a one-hour time interval. Parameters recorded by the instrument included date, time, water temperature DO concentration, pH, and percent internal battery voltage. The MS5 was then lowered and secured in the Swift No. 2 Project tailrace in a perforated aluminum stilling well at a depth of approximately ten feet (Figure 14), although the actual depth of the multiprobe varied somewhat by season depending on reservoir elevation.

After being deployed, the MS5 was downloaded and serviced approximately once every four weeks during the monitoring period to minimize the potential for data gaps due to instrument loss or malfunction. During servicing, the instrument was checked for proper performance, inspected for sediment or algae build-up, and cleaned as needed. Data files were downloaded to a spreadsheet during servicing and reviewed for potential outliers and other suspect data. If the data appeared suspect, staff implemented the necessary corrective measures prior to leaving the project site or replaced the instrument with the backup MS5 while it was being repaired.

Following field data collection, hourly pH and DO data were analyzed to determine daily maximums and minimums. In addition, the water temperature data were analyzed and expressed as 7-DADMax values.

It should be noted that in 2010, Cowlitz PUD integrated its tailrace water quality monitoring program into their existing SCADA system to facilitate remote data access.

[5] Unlike older Clark cell sensors, Hach/Hydrolab LDO sensors have no membrane or electrolyte, and calibration is recommended just once per year. Passive fouling will not affect the LDO sensor because the sensor does not need to consume oxygen.

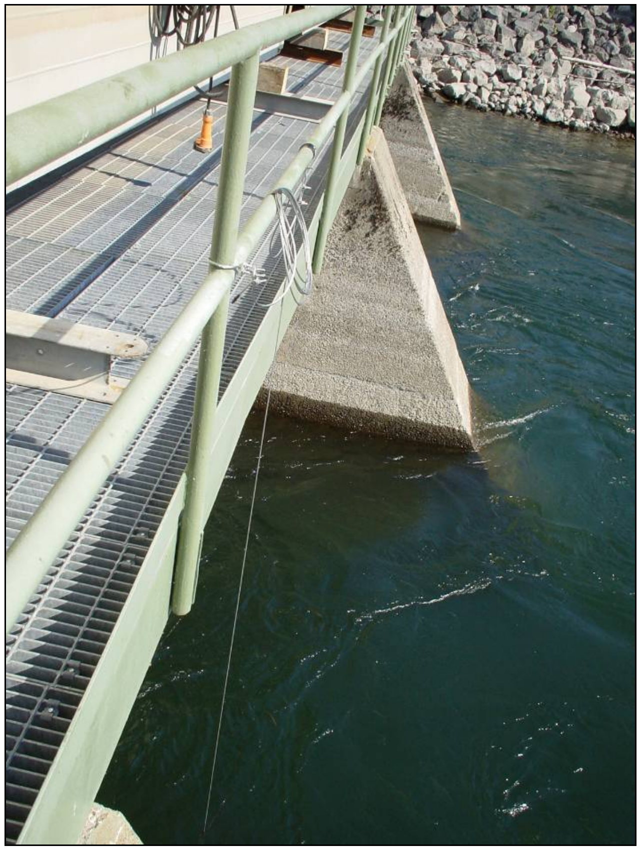

Figure 14. Swift No. 2 tailrace Hach/Hydrolab deployment cable and sampling location.

Results and Discussion

This section of the report presents the results of water temperature, DO, and pH monitoring at the Swift No. 2 tailrace site from January 1, 2011 through December 31, 2011. During this period, the hourly water temperature data were 99.6% complete, the hourly DO data were 100% complete, and the hourly pH data were 100% complete. The majority of the data gaps that occurred in 2011 were the result of occasional routine data downloading and instrument cleaning or erroneous measurements that were removed during QA/QC (Appendix ?).

Water Temperature

According to Ecology's water temperature standards for lakes, human actions considered cumulatively may not increase the 7-DADMax water temperature more than 0.3°C above natural conditions[6]. Between January 1 and December 31, 2011, 7-DADMax water temperatures recorded in the Swift No. 2 tailrace (Yale Lake) ranged from 3.3°C to 15.8°C (Figure 15). Daily maximum water temperatures in the tailrace ranged from 4.1 to 15.8°C. As noted in Figure 8, the highest 7-DADMax water temperature recorded at the Swift No. 2 forebay site during the summer of 2011 was 12.8°C (at the 3-foot depth interval). The highest 7-DADMax water temperature recorded at the remaining forebay depth intervals

[6] http://www.ecy.wa.gov/programs/wq/swqs/criteria-freshwater/wac173201a_200-temp.html

ranged from 12.4 to 12.8°C. During July and August, surface water temperatures in Yale Lake can exceed 20°C (PacifiCorp Energy and Cowlitz PUD 2010). Based on this information, it is clear that water temperatures greater than 12.8°C observed in the tailrace in 2011 were likely not the direct result of Swift No. 2 Project operations, but rather the result of warm Yale Lake surface water entering the tailrace sampling area during periods when the project was off-line or generating at very low levels. This relationship is evident in the hourly water temperature charts presented in Attachment L**Error! Reference source not found.**: Cowlitz PUD Appendices, Appendix B. Overall, discharges from the Swift No. 2 Project canal/forebay function to cool water temperatures in the upper end of Yale Lake during the summer, improving aquatic habitat for salmonids.

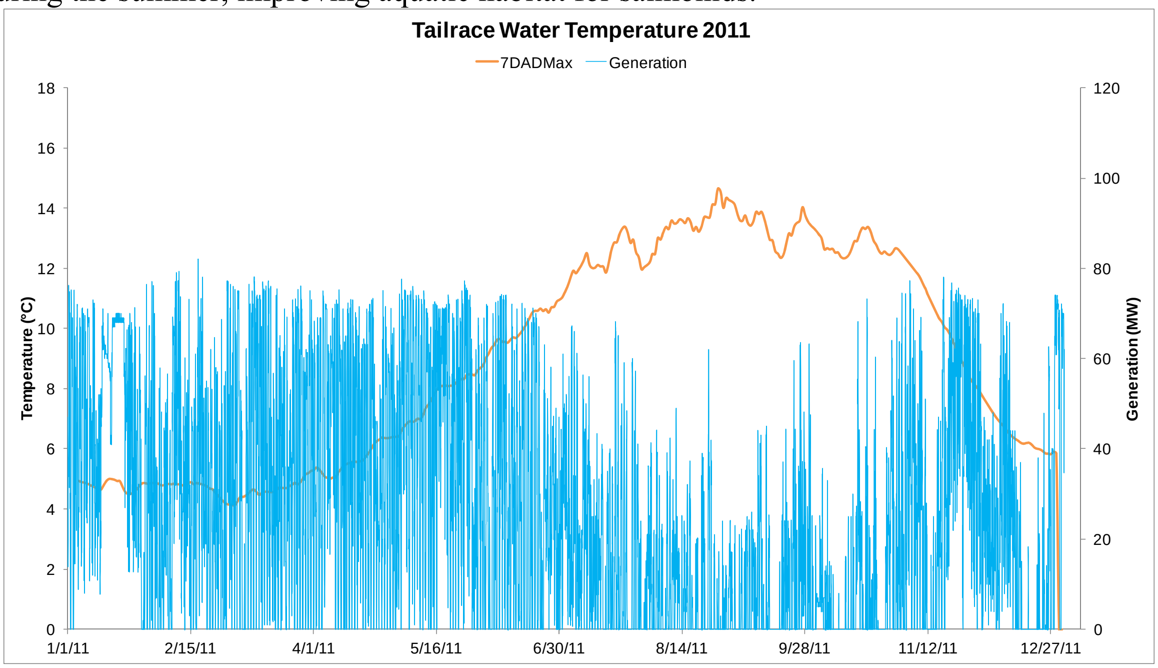

Figure 15. 7-DADMax water temperatures recorded in the Swift No. 2 tailrace between January 1, 2011 and December 31, 2011.

Dissolved Oxygen

According to Ecology's DO standards for lakes, human actions considered cumulatively may not decrease the DO concentration more than 0.2 mg/l below natural conditions.[7] Between January 1 2011 and December 31 2011, DO concentrations in the Swift No. 2 tailrace ranged from 7.7 mg/l to 13.2 mg/l (Figure 16). The lowest DO concentrations were observed during the month of August and September. As noted in the previous section, periods of project generation serve to decrease water temperatures and increase DO concentrations in the Swift No. 2 tailrace during the summer months (Attachment L: Cowlitz PUD Appendices, Appendix C). During periods when the project was not generating (or generating at very low levels), warm surface water in Yale Lake naturally flows back into the Swift No. 2 project tailrace where water quality conditions become representative of the surface of Yale Lake (i.e. warmer summer water temperatures and correspondingly low DO concentrations).

[7] http://www.ecy.wa.gov/programs/wq/swqs/criteria-freshwater/wac173201a_200-do.html

Consequently, the lower DO concentrations observed during 2011 were likely not the direct result of Swift No. 2 Project operations, but rather the result of warm Yale Lake surface water entering the tailrace sampling area. The human caused variation in DO in Yale Lake due to Swift No.2 Project operations is unknown; however, the higher DO concentrations associated with Swift No. 2 Project operations (as a function of colder water temperatures) are likely to be beneficial to salmonids in the upper end of Yale Lake.

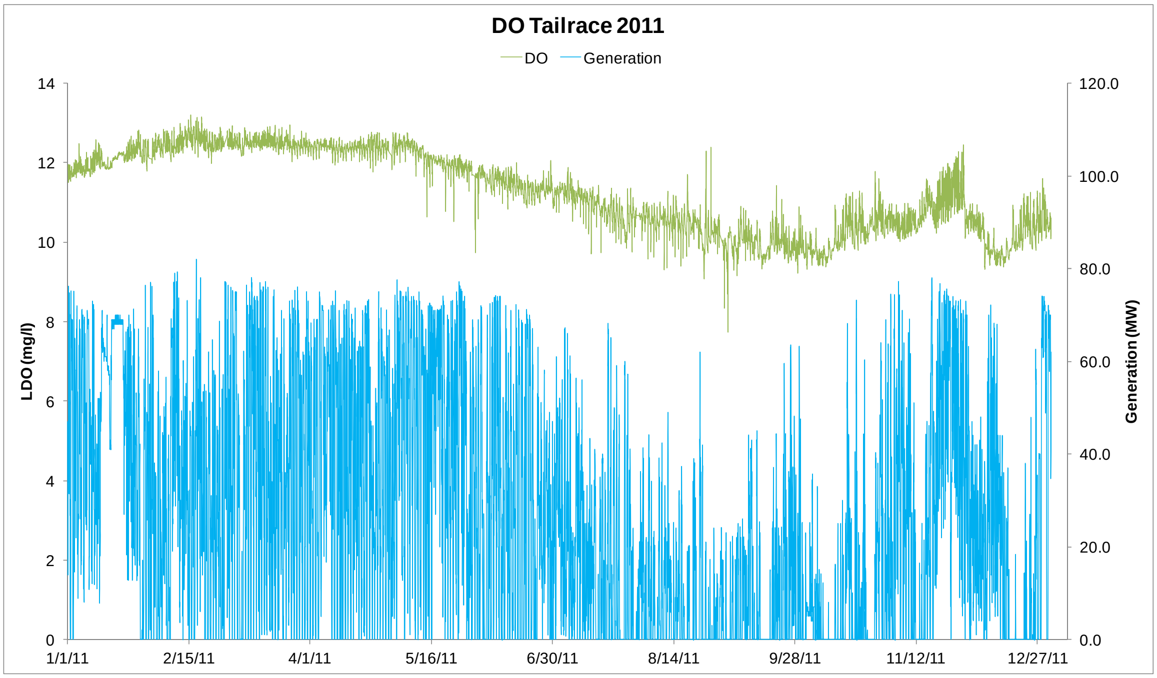

Figure 16. Hourly DO concentrations recorded in the Swift No. 2 tailrace between January 1, 2011 and December 31, 2011.

pH

In Washington, there are no specific pH criteria for lakes. The standard simply reads there will be "no measurable change from natural conditions." Between January 1, 2011 and December 31, 2011, pH values recorded in the Swift No. 2 tailrace ranged from 6.7 to 7.9 and had a median value of 7.4 (Figure 17). The human caused variation in pH in Yale Lake due to Swift No.2 Project operations is unknown. The relatively pH values observed in 2011 that were lower than 6.5 may be associated with natural respiration and decomposition processes occurring in Swift Reservoir and Yale Lake[8] or from inflow into the canal from the large wetland/pond complex located just north of the canal (the wetland/pond complex drains directly into the canal via two culverts). In addition, circumneutral to slightly acidic conditions with low buffering capacity are common in western Cascades Rivers, because of slightly acidic rainfall and the generally low capacity of water to buffer and neutralize acid.

[8] http://www.ecy.wa.gov/programs/wq/plants/management/joysmanual/ph.html

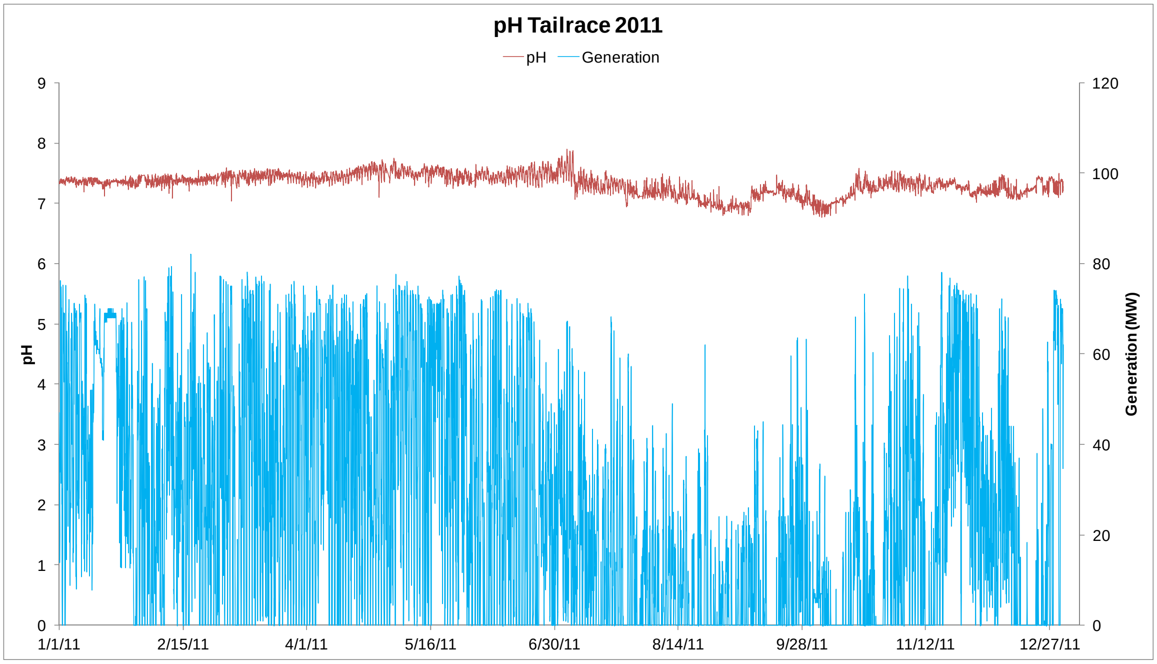

Figure 17. Hourly pH values recorded in the Swift No. 2 tailrace between January 1, 2011 and December 31, 2011.

Conclusion

This annual report describes the in-situ measurements and analysis of water temperature, DO, and pH in the Swift No. 2 Project tailrace from January 1 through December 31, 2011. As expected and as previously documented (PacifiCorp Energy and Cowlitz PUD 2010), the results of sampling during this period indicate that the overall water quality in the Swift No. 2 Project tailrace is good. During 2011, 7-DADMax water temperatures in the tailrace (upper end of Yale Lake) ranged from 4.1°C to 14.7°C (Figure 15). During the summer, discharges from the Swift No. 2 Project function to cool the water in the upper end of Yale Lake, improving aquatic habitat conditions for salmonids and other native cold water fish species. However, during periods when the project is off-line water temperatures in the tailrace can increase as warmer surface water in the lake begins to enter the tailrace area (Attachment L: Cowlitz PUD Appendices, Appendix B).

DO values recorded in the Project tailrace during 2011 ranged from 7.7 mg/l to 13.2 mg/l (Figure 16) and were also closely tied to periods of project generation. The lowest DO concentrations were observed during the month of August. As can be seen in Cowlitz PUD appendices (Attachment L**Error! Reference source not found.**: Cowlitz PUD Appendices), periods of project generation served to decrease water temperatures and increase DO concentrations in the Swift No. 2 tailrace during the summer months.

The pH values recorded in the Swift No. 2 tailrace during 2011 ranged from 6.7 to 7.9 and had a median value of 7.4 (Figure 17). The human caused variation in pH in Yale Lake due to Swift No.2 Project operations is unknown. However, the relatively low pH values observed in 2011 may have been the result of natural respiration and decomposition processes occurring in Swift Reservoir and Yale Lake or from water entering the canal from the large wetland/pond complex located to the north of the canal.

Future Water DO, Water Temperature and pH Monitoring Activities

Unless otherwise directed by Ecology, Cowlitz PUD plans to continue monitoring DO, water temperature, and pH in the Swift No. 2 Project tailrace in 2011

4.3.3 Swift No. 2 Tailrace Total Dissolved Gas (TDG) Monitoring (401) Certification Section 4.8.3

Section 4.8.3 Study completed in 2008 and included in the 2008 Annual Report**.**

4.3.4 Swift No. 2 Surge Arresting Structure Total Dissolved Gas (TDG) Monitoring (401) Certification Section 4.3.5 as amended

Certification Section 4.3.5 as amended Study completed in 2007 and included in the 2007 Annual Report.

4.3.5 SA Section 9.4 Water Quality Monitoring

Cowlitz PUD submitted a Draft Swift No. 2 Water Quality Management Plan to Ecology in September 2008 and met with and received comments from Ecology in November 2008. Cowlitz PUD submitted an updated Draft Swift No. 2 Water Quality Management Plan to Ecology on May 6, 201

4.4 Cowlitz PUD Water Quality 2012 Annual Plan

4.4.1. Water Quality Management Plan

Cowlitz PUD will conduct monitoring as specified in the Water Quality Management Plan.

4.4.2. Water Quality Equipment Installation

Cowlitz PUD will continuously monitor water temperature, pH and DO in the Swift No. 2 tailrace.

Cowlitz PUD will monitor water temperature at both the log boom and forebay sites, between June and September 2012.

5.0 TERRESTRIAL RESOURCES

5.1 TCC Meetings

The purpose and role of the TCC, as defined in Section 14.1 of the Settlement Agreement, is to facilitate coordination and implementation of the Terrestrial PM&E measures.

The structure and process of the TCC is intended to provide a forum to address time-sensitive matters, early warning of problems, and coordination of member organization actions, schedule, and decisions to save time and expense. The TCC makes decisions based on consensus, while implementing the Settlement Agreement.

5.1.1 Meetings and Conference Calls: Overview

This section summarizes the issues covered and areas of consensus reached during TCC meetings and conference call(s) over the 12-month report period.

TCC Meeting #1
January 12, 2011

- PacifiCorp thanked the TCC for their approval and role in the Saddle Mountain and Swift Creek parcel land acquisitions. These closed on December 23, 2010 and added another 969 acres to the Wildlife Habitat Management Plan (WHMP) lands.
- The Bonneville Power Authority (BPA) I-5 Corridor Reinforcement project was discussed, including impacts to PacifiCorp's WHMP mitigation lands.
- There are some identified hazard trees by the Hydro Control Center (HCC) which need to be removed.
- Rocky Mountain Elk Foundation (RMEF) will be holding a two-day workshop titled "Professional's Day" on the Lewis River this summer.

TCC Meeting #2
February 9, 2011

- Cowlitz PUD reviewed the *Swift No. 2 Annual Plan* with the TCC and requested comments back by March 9, 2011.
- PacifiCorp announced that the *ACC/TCC 2010 Annual Report* will be out for review March 1, 2011.

- The TCC agreed to discontinue management on the four orchard trees in ROW 5/11-6/11, which is owned by DNR.

- Per PacifiCorp's request, BPA contractors completed the vegetation cover-type mapping along potential line segments on the WHMP mitigation lands and have also completed the bald eagle roost surveys.

- The hazard trees by the HCC were surveyed and found to be in the WHMP boundary. The TCC approved necessary pruning and stem removal to ensure safety.

- The TCC made a site visit to Management Units 9 and 10 to view the new Saddle Mountain land acquisition and potential impacts of the proposed BPA transmission line.

TCC Meeting #3
March 9, 2011

- Cowlitz PUD and PacifiCorp issued their annual plans and reports to the ACC and TCC for review and comment. Cowlitz PUD expressed concern regarding the administrative costs for planning and reporting. Additionally, accumulating dollars over a period of time (instead of spending the budgeted amount each year) would enable more significant habitat measures to be implemented.

- RMEF announced that PacifiCorp was awarded the Silver Benefactor award for donations to the foundation and their continued assistance in managing the mitigation lands.

- The *ACC/TCC 2010 Annual Report* was reviewed briefly and the *WHMP 2010 Report* and *WHMP 2011 Annual Plan* were both reviewed in more detail.

- BPA and their contractors will present their findings from the vegetation cover-type mapping and the bald eagle roost surveys to the TCC in May or June.

- RMEF has identified June 24 and 25, 2011 as the dates for the Professional's Day workshop.

TCC Meeting #4
April 14, 2011

- Columbia Land Trust met with the TCC to discuss a potential land acquisition.

- The USDA Forest Service announced that it will be doing maintenance and repair work on the Swift Canal Bridge which will require the bridge to be closed for approximately two days at two different times during the summer.

- The logistics of the RMEF Professional's Day were discussed.
- An update was provided on the proposed BPA transmission line through WHMP lands.
- WDFW provided comments on the *ACC/TCC 2010 Annual Report* and these comments were addressed in the meeting and PacifiCorp agreed to integrate them into the final report when filed with FERC.
- Due to budget and access issues, PacifiCorp proposed that the timber harvest of Unit 22 be delayed and the money used to rehabilitate the new land acquisition by Swift and to enhance habitat in Unit 28.

TCC Meeting #5
May 11, 2011

- Representatives from BPA attended along with the contractors who conducted the vegetation type mapping and bald eagle roost surveys on behalf of BPA. They presented to the TCC the results of the studies. A subcommittee was formed to draft a letter response to BPA regarding the proposed transmission line through WHMP lands.
- Cowlitz PUD met with the Forest Service regarding the maintenance on the Swift Canal Bridge. It was agreed that coordination would need to happen for this bridge to be closed for the construction, and there were concerns about water quality and environmental safety. The Forest Service agreed to attend to all these issues.

TCC Meeting #6
June 8, 2011

- The BPA Subcommittee presented the letter they drafted to the TCC regarding the proposed BPA transmission line routes through PacifiCorp's WHMP lands. The letter was reviewed, modified, and approved.
- The Swift fund as identified in the SA for lands purchase was discussed.
- The TCC visited the Speelyai Day-Use Area with PacifiCorp's recreation manager to review the hazard trees at the site. The committee agreed the alders needed to be cut down and discussed options for replanting.
- The recreation manager reviewed the plans at Saddle Dam for the equestrian parking area. The TCC agreed to the plans as they were presented.

- The Yale Bridge boater takeout area was viewed next, where the recreation department has designed a staircase to be constructed with a small dock that would allow a safer means of egress for kayakers. The TCC recommended that construction occur after August to prevent disturbance to the osprey nest on the bridge.

- The last site visit was to the timber harvest area at Management Unit 28. PacifiCorp explained its plan to remove overstory trees to release understory shrubs and the TCC agreed.

TCC Meeting #7
July 13, 2011

- RMEF and PacifiCorp held Professional's Day on the Lewis River last month and the workshop was an overall success. The committee reviewed what went well and what could be done to improve for future tours and workshops.

- The Forest Service's repair and maintenance of the Swift Canal Bridge was reviewed. Work had been delayed but the intention remained to do some work in 2011.

- An update was provided on the BPA transmission line. The TCC's response letter was sent out on June 13, 2011.

- PacifiCorp presented to the TCC a private landowner's request to build a dock on Swift reservoir. PacifiCorp requested both the ACC and the TCC to review the request and provide recommendations on how to best proceed. After reviewing the request and the Shoreline Management Plan (SMP), the TCC agreed that building the dock would not be in line with the SMP, but to leave the existing boat mooring was acceptable.

- PacifiCorp discussed the proposed harvest and forest management of Management Unit 28.

- The TCC made a site visit to Management Unit 33 to review the property purchased last year and discuss how to best manage the land to meet the goals of the WHMP.

TCC Meeting #8
August 10, 2011

- An update was provided on a potential land transaction.

- PacifiCorp advised that the cultural survey on the proposed timber harvest area of Unit 28 had been completed.

- PacifiCorp reported to the TCC that the attempts to find a party to conduct a broadcast burn of Unit 33 have not been successful, and the backup plan would be to scarify the area. Other management activities were proceeding as planned.

- The Initial Evaluation of the old-growth stands on the Lewis River WHMP lands had been completed and was distributed to the TCC for review.

- The first round of goshawk surveys had been completed and nothing was found.

- BPA attended to discuss the proposed transmission line on WHMP lands and respond to the TCC's initial response letter.

TCC Meeting #9
September 14, 2011

- PacifiCorp's recreation manager attended to discuss the elk-equestrian study required by the SA at Saddle Dam and the possibility of opening Cresap Bay earlier in the season. A few options for conducting the study were proposed, and PacifiCorp agreed to investigate these and return next month with a plan. As for opening Cresap Bay earlier in the season, this was approved pending appropriate mitigation for the impacts to elk and the land.

- WDFW provided comments on PacifiCorp's old-growth initial evaluation report. These were reviewed and addressed in the meeting.

- PacifiCorp requested input from the TCC for ways to streamline the annual reporting process. The members were asked to consider some options and return next month with suggestions.

- The Unit 28 timber harvest was underway with no issues.

- PacifiCorp presented some seed mix ideas for Management Unit 33. Suggestions were reviewed and PacifiCorp agreed to follow-up with a final determination.

TCC Meeting #10
October 12, 2011

- An update was provided on a potential land transaction.
- PacifiCorp presented a draft map and study plan to address recreation impacts on elk at the Saddle Dam Farm. The study was identified as part of the Settlement Agreement. The TCC approved of the plan.

- PacifiCorp provided an update on forestry management in Unit 28 and discussed the new grass/legume seed mix that was developed for use in Units 28 and 33. The TCC had received a copy of the proposed seed mix earlier in the month.

- The TCC discussed the BPA transmission line project and potential impacts to WHMP lands.

- The TCC approved streamlining the annual reports and plans through the use of more tables and high-level summaries.

- PacifiCorp informed the TCC that they had moved forward with fall fertilizing at the Cresap Bay Park grass areas and conducted invasive plant spraying on the septic drain field as previously discussed and approved by TCC.

- The TCC discussed the need for PacifiCorp to build a new drain field associated with the Speelyai Bay Day Use Area. A tentative proposal was discussed for placing a drain field at an orchard site. The TCC expressed conditional concern about recreation impacts on WHMP lands.

TCC Meeting #11
November 9, 2011

- PacifiCorp provided an update on the elk-equestrian study.

- The TCC discussed the BPA transmission line project and potential impacts to WHMP lands.

- An update was provided on a potential land transaction.
- The TCC continued discussion on the BPA transmission line project and potential impacts to WHMP lands.

TCC Meeting #12
December 14, 2011

- PacifiCorp provided an update on the elk-equestrian study, a land acquisition update and continued discussion on the BPA transmission line project.

- PacifiCorp provided the TCC a summary of recent acts of vandalism and continued unauthorized use of closed roads by the public.

5.1.2 Meeting Notes

Meeting notes are drafted for TCC meetings and conference calls. These drafts are distributed to TCC members for review and comment approximately one week after the subject meeting. After any needed corrections are made, the notes are approved by consensus of the TCC. The notes are then made part of the public record and posted on the PacifiCorp Energy web site:
http://www.PacifiCorp Energy.com/es/hydro/hl/lr.html# (License Implementation).

5.2 PacifiCorp Energy Terrestrial Measures Implemented as of the End of 2011

This section presents the actions taken during January 2011 through December 2011 toward PacifiCorp Energy terrestrial requirements in the Lewis River Settlement Agreement. It also includes previously completed Settlement Agreement actions. In addition, PacifiCorp Energy implements road and culvert maintenance that is required under the Forest Practices Act (Chapter 222-24 WAC, or current Forest Practice Rules) and these are described in Attachment O.

A discussion of the activities associated with each of the measures is presented by SA Article for the report period (Table 3). A description of funding amounts deposited and disbursed during 2011 is provided in Section 7.0 – Funding.

5.2.1 SA Section 10.1 Yale Land Acquisition and Habitat Protection Fund

PacifiCorp Energy completed its settlement agreement and FERC license commitment under the Yale Land Acquisition Fund for acquiring land in 2010 with the purchase of 490 acres (198.3 ha) of land near Saddle Dam.

5.2.2 SA Section 10.2 Swift No. 1 and Swift No. 2 Land Acquisition and Habitat Protection Fund

PacifiCorp Energy and the Columbia Land Trust (CLT) continued their agreement (consistent with Section 10.2 of the Settlement Agreement and TCC approval) through April 2011 towards assisting in negotiations and assessing feasibility of acquiring Interests in Lands owned by a large timberland owner near Swift Reservoir. After determining that a conservation easement or sale could not be attained that would allow implementation of the WHMP goals and objectives, the agreement with CLT was discontinued. The TCC however approved beginning acquisition of interests in lands from another land owner facilitated by the Rocky Mountain Elk Foundation. The Swift No. 1 and Swift No. 2 Fund are currently at $ 4,653,170.00 (as of December 31, 2011).

Because of confidentialities in acquiring other lands, specific discussion is not included in this annual report other than to indicate that opportunities continue to be discussed.

5.2.3 SA Section 10.3 Lewis River Land Acquisition and Habitat Protection Fund

The next addition to this fund is scheduled for December 2014. There is currently no balance in this fund because of the contribution made in 2010.

5.2.4 SA Section 10.4 Transaction Costs

Transaction costs incurred in 2011 using the Swift No. 1 and Swift No. 2 Land Acquisition and Habitat Protection Fund are discussed in Section 7.0.

5.2.5 SA Section 10.5 Management of Funds

PacifiCorp Energy made interest contributions to Swift No. 1 and Swift No. 2 Land Acquisition and Habitat Protection Funds in 2011. The Funds continue to be tracked in an account and is inclusive of accrued interest pending any transactions (see Section 7.0).

5.2.6 SA Section 10.6 Completed Implementation Advanced Purchases

As identified in the Settlement Agreement article 10.6.2, PacifiCorp Energy acquired 770 acres (in 2000) of wildlife habitat near Cougar and Panamaker Creeks and established a 213 acre conservation covenant on those lands for the protection of bull trout. Routine maintenance of culverts, existing road closures, forestry management, and invasive plant species control continued in 2011. Attachment N provides a copy of the *Lewis River Wildlife Habitat Management Plan 2011 Annual Report*, which provides a summary of the terrestrial protection, mitigation, and enhancement measures that were implemented in this area during 2011.

5.2.7 SA Section 10.7 Conservation Easements

See section 5.2.1 above.

5.2.8 SA Section 10.8 Wildlife Habitat Management Plan

PacifiCorp Energy completed the WHMP and submitted it to the FERC on December 23, 2008. The Utilities each received a FERC approval for their respective WHMP's on May 29, 2009.

Article 403 of the Merwin, Yale, and Swift No. 1 licenses and Section 14.2.6 of the Settlement Agreement directs PacifiCorp Energy to prepare and file with the FERC a detailed Annual Report (Federal Energy Regulatory Commission 2008a, 2008b, and 2008c, PacifiCorp Energy et al. 2004). Attachment N provides a copy of the *Lewis River Wildlife Habitat Management Plan 2011 Annual Report*.

5.3 PacifiCorp Energy Terrestrial 2012 Annual Plan

This section presents PacifiCorp Energy's Terrestrial Resources Annual plan which identifies planned 2012 activities as organized by the Settlement Agreement measures.

5.3.1 SA Section 10.2 Swift No. 1 and Swift No. 2 Land Acquisition and Habitat Protection Fund

PacifiCorp Energy will continue work initiated in 2011 in coordination with the TCC regarding the acquisition of interests in land in the vicinity of Swift Reservoir. Fund account information is provided in Section 7.0.

5.3.2 SA Section 10.3 Lewis River Land Acquisition and Habitat Protection Fund

The Lewis River Fund had contributions of $1,580,429.64 in 2010 that were committed to the Yale land purchase (Saddle Mountain) in 2010 to make up for the shortfall of the Yale Funds. The Lewis River Fund was to be funded by six months following the fourth year of the FERC licenses for Yale and Swift No. 1 Projects, or by December 26, 2012. PacifiCorp agreed to fund the amount of the shortfall for the Yale purchase using the Lewis River Fund prior to the actual time the dollars were to be committed and the TCC approved. The next addition to this fund is scheduled for December 2014.

5.3.3 SA Section 10.4 Transaction Costs

Transaction costs incurred in 2012 will be managed in accordance with SA language and reported in the 2012 Annual Report.

5.3.4 SA Section 10.5 Management of Funds

Funds provided by PacifiCorp Energy in 2012 will be managed in a tracking account and in accordance with SA language. Contribution amounts and interest gained will be identified in the 2012 Annual Report. See Fund account information provided in Section 7.0 for end of 2011 amounts.

5.3.5 SA Section 10.6 Completed Implementation Advanced Purchases

PacifiCorp Energy will continue to manage the Cougar Creek Conservation Covenant lands and the company lands on the Swift Creek Arm for the long-term benefit of fish, wildlife, and native plants. These lands are managed under the WHMP as described in SA 10.8.

5.3.6 SA Section 10.7 Conservation Easements

Guidelines for the selection and acquisition of conservation easements will be considered in the acquisition of Interests in Lands to be purchased with Funds described in SA 10.1 through 10.3.

5.3.7 SA Section 10.8 Wildlife Habitat Management Plans

The 2012 Annual Plan fulfills PacifiCorp Energy's obligations for the license's Article 403 and Settlement Agreement 10.8.3 and is provided in Attachment M. The plan details the terrestrial protection, mitigation, and enhancement measures that are planned to be implemented on WHMP lands in the following year (i.e., January 1 to December 31, 2012).

5.4 Cowlitz PUD Terrestrial Measures Implemented in 2011

5.4.1 SA Section 10.6 Completed Implementation: Advance Purchases [Devil's Backbone Conservation Covenant]

Cowlitz PUD managed the Devil's Backbone Conservation Covenant to benefit bull trout.

5.4.2 SA Section 10.8.1 Development of the Wildlife Habitat Management Plan (WHMP)

Cowlitz PUD filed the Swift No. 2 WHMP with FERC on December 23, 2008. FERC issued an *Order Modifying and Approving Habitat Management Plan* on March 31, 2009. FERC's Order approved the WHMP and added the following requirements:

- File an Annual Habitat Management Report by April 30 of each year; and
- In the event changes are made to the WHMP, file these changes with the Commission and the TCC.

This Section 5.4 fulfills Cowlitz PUD's obligation to file WHMP Annual Report.

5.4.3 SA Section 10.8.2 WHMP Fund

On December 26, 2010, Cowlitz PUD made $16,773.02, available for 2011 (Year 3) WHMP activities. Table 2.1-1 in the 2011 WHMP Annual Plan (March 28, 2011) included a list of proposed actions and estimated costs based on the 2011 budget. Table 8 below illustrates the 2011 Budget, including estimated cost, year-end cost and difference between the two.

Table 8. Cowlitz PUD WHMP year three 2011 Budget.

Total 2011 Budget	$16,773.02		
WHMP Activity	**2011 Budget**	**2011 Year End**	**Difference**
Administration	$9,333	$ 5,520.08	$ 3,812.92
Annual inspection to monitor and manage public access	$1,415	$ 90.00	$ 1,325.00
Invasive plant surveys at high priority sites (includes access monitoring and shrub survival)	$1,415	$ 3,228.00	$ (1,813.00)
Evaluate survival of trees and shrubs planted around PWMU-PUB in 2010.	$0	$ -	$ -
Invasive Species Control	$4,570	$ 3,983.53	$ 586.47
Total 2011 Budget	**$16,733.02**	$ 12,821.61	$ 3,951.41

Table 9 below provides the WHMP Tracking Account summarizing the WHMP budget and expenditures each year. Because the WHMP fund was over-expended during 2010, no interest was accrued at Year End. On December 26, 2011, Cowlitz PUD made $21,039.32 available for Year four 2011 WHMP activities.

Table 9. Cowlitz PUD WHMP Tracking Account.

Year	Year Begin Date	WHMP Begin Balance	WHMP Annual Payment at Year Begin	WHMP Begin Balance + Annual Payment	WHMP Funds Dispersed at Year End	Year End WHMP Funds Remain	Interest Accrued Year End WHMP Funds	WHMP Year End Balance	WSJ Prime Rate Apr 1
1	26-Dec-08	0	$16,320.97	$16,320.97	$18,855.49	$(2,534.52)	0	0	0.0325
2	26-Dec-09	0	$16,659.03	$16,659.03	$18,230.01	$(1,570.98)	0	0	0.0325
3	26-Dec-10	0	$16,773.02	$16,733.02	$12,821.61	$3,951.41	$128.42	$4,079.83	0.0325
4	26 Dec-11	$4,079.83	$ 16,959.49	$21,039.32					
5	26 Dec-12		$17,468.28						

5.4.4 SA Section 10.8.3 Management of the Plan [Implementation of the Annual Plan]

After consultation with the TCC, Cowlitz PUD filed the Swift No. 2 Year 3 2011 WHMP Annual Plan with FERC on March 28, 2011. FERC approved the Annual Plan via a June 30, 2011 letter. In that approval letter, FERC indicated that in the future, staff will not issue an acknowledgement letter. Instead, FERC's posting of the Annual Reports on its e-library system will be considered acknowledgment of receipt.

Invasive Plant Surveys

The invasive plant surveys are designed to focus on areas identified in the WHMP as high priority due to the following:

1. Known concentrations of invasive plants;
2. Presence of ecologically sensitive resources, such as wetlands; or
3. Soil disturbance or traffic that could pose a risk of introduction or spread of invasive plants.

Surveys do not cover the transmission line right of way (ROW) or re-vegetated habitat south of the maintenance road, because these areas are treated under on-going operation and maintenance programs separate from the WHMP.

The surveys are conducted according to standard operating procedures (SOPs) outlined in the WHMP (Section 5.8, Invasive Plant Management SOPs). Survey routes are documented using a hand-held GPS unit, and the boundaries of recommended weed treatment areas are flagged. GPS data points are transferred into the project GIS and used to prepare maps of areas selected for weed treatment. Figure 18 and Figure 19 illustrate weed treatment areas that have been delineated in the Devil's Backbone and Project Works management units (MUs) to date.

Updated noxious weed lists are obtained annually from the Cowlitz County and Washington State noxious weed control boards (Skamania County follows the state listings). Classification of target weed species observed in the Swift No. 2 WMA in 2011 is shown in Table 10. There were no changes in plant status in 2011.

Table 10. Weed classification of invasive species observed in the Swift No. 2 WMA.

Species Name	Cowlitz County	Skamania County (Washington State)
Bull thistle	C	C
Canada thistle	B	C
Common cat's-ear	B	B
Himalayan blackberry	C	C
Scotch broom	B	B
Tansy ragwort	B	B

Initial Invasive Plant Surveys

Meridian Environmental, Inc. completed initial invasive plant surveys in all high priority areas of the Devil's Backbone MU in 2009. Follow-up surveys in the Devil's Backbone MU are described in the section titled "*Invasive Plant Species Follow-up Surveys*".

The third year of initial invasive plant surveys was conducted in the Project Works MU on June 8, 2011. The 2011 survey completed coverage of the steep borrow site north of the Swift No. 2 power canal (Figure 18 as PW-E) that had been partially surveyed in 2010. Invasive species observed in PW-E in 2011 are listed below in Table 11.

Table 11. Target species, distribution, and percent cover observed during initial invasive plant surveys (2011).

Weed Survey Area	Acres	Target Species, Distribution, and Estimated Cover (%)
PW-E	14.7	Bull thistle, clumped, 0-5% (2 plants) Canada thistle, clumped, 0-5% (~12 plants) Common cat's-ear, scattered/even, 0-5% Scotch broom, clumped, 0-5% (1 plant)

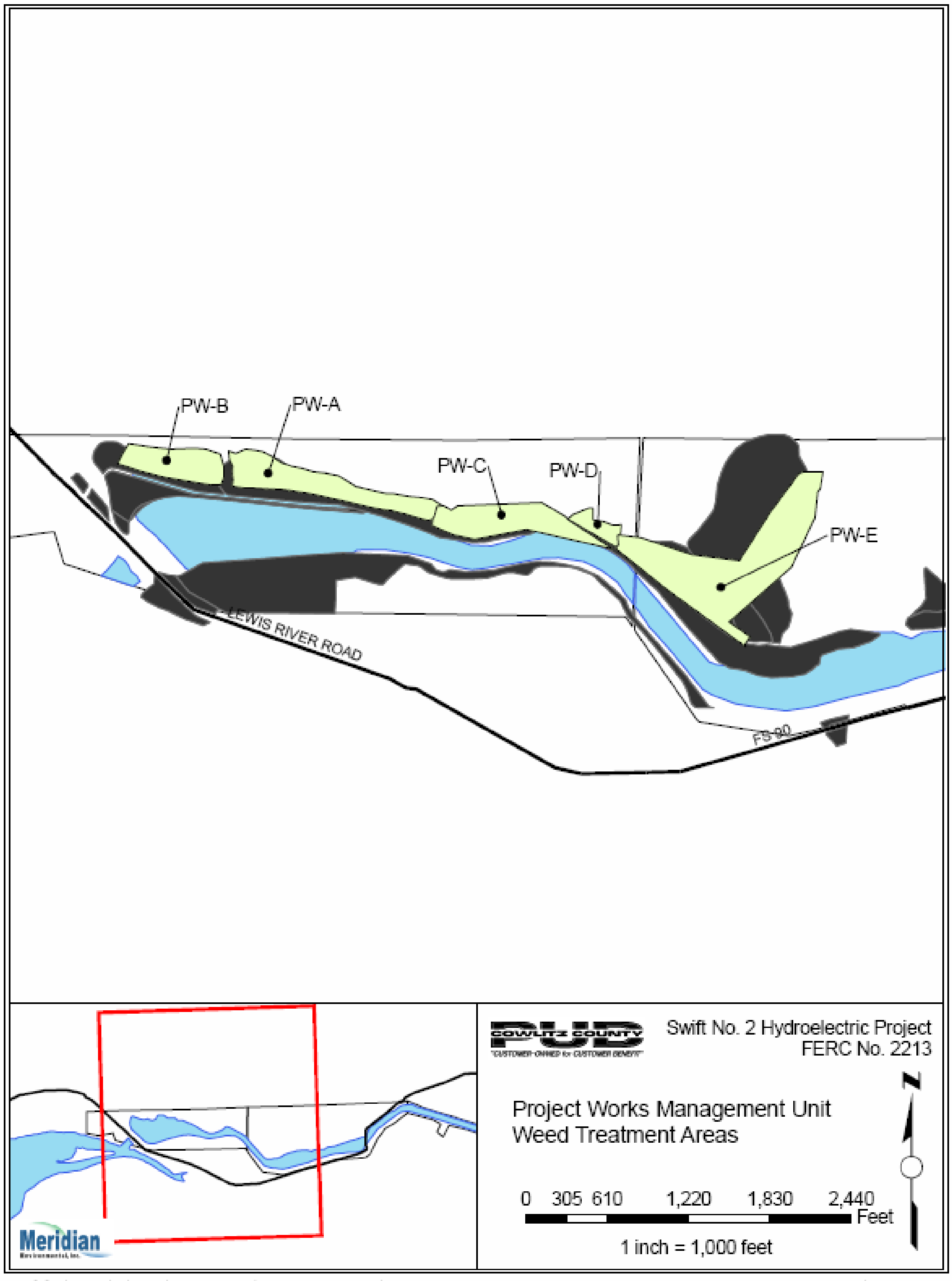

Figure 18. 2010 Project Works Management Unit weed survey and treatment areas.

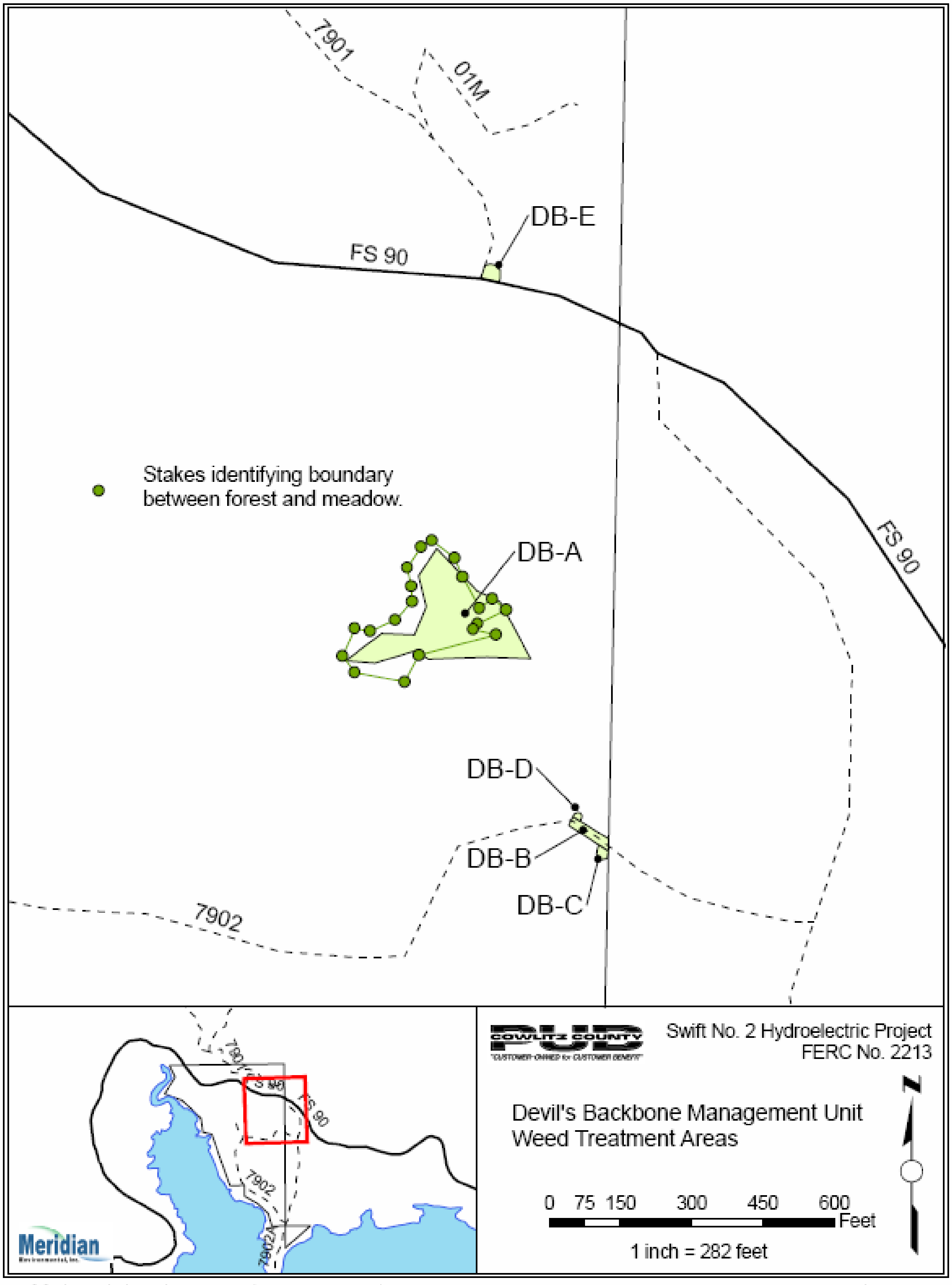

Figure 19. 2010 DBMU weed survey and treatment areas.

Invasive Plant Species Follow-up Surveys

On June 8, 2011, Meridian conducted the first year of follow-up invasive plant surveys in areas shown in Figure 18 as sites PW-C and PW-D, and the second year of follow-up surveys in DB-A, DB-B, DB-C, DB-D, DB-E, PW-A, and PW-B (Figure 18 and Figure 19). The purpose of the follow-up surveys was to determine the effectiveness of herbicide applications at two years post-treatment, effectiveness of mechanical removal of Himalayan blackberry and Scotch broom one year post-treatment, and to identify future treatment needs. Table 12 lists the target species observed in these areas and summarizes their distribution and estimated cover.

Table 12. Target species, distribution, and percent cover observed during follow-up surveys (2011).

Year Post-Treatment	Survey Area	Survey Acres	Target Species, Distribution, and Estimated Cover (%)
Devil's Backbone MU			
2	DB-A	0.9	Canada thistle, scattered (5-25%)
2	DB-B	0.04	Common cat's ear, scattered (5-25%)
2	DB-C	0.01	Common cat's ear, scattered (5-25%)
2	DB-D	0.01	Common cat's ear, scattered (5-5%) Scotch broom, clumped (1 plant)
Project Works MU			
2	PW-A	6.5	Common cat's-ear, scattered, 0-5% Scotch broom, scattered, 0-5% (less than 5 plants)
2	PW-B	3.8	Common cat's-ear, scattered, 0-5% Scotch broom, scattered, 0-5% (less than 5 plants)
1	PW-C	5.5	Bull thistle, scattered, 0-5% (2 plants) Canada thistle, scattered, 0-5% (20 plants) Himalayan blackberry, scattered, 0-5% (2 plants) Scotch broom, scattered, 0-5% (2 plants) Tansy ragwort, scattered, 0-5% (1 plant)
1	PW-D	1.1	Scotch broom, scattered/patchy, 0-5%

Devil's Backbone MU

In Weed Treatment Area DB-A (the meadow complex in the Devil's Backbone MU), the 2011 follow-up surveys indicated no increase in the cover of Canada thistle at two years post-treatment (a combination of Milestone VM and Competitor in July and September, 2009); the estimated percent cover remained about the same after the initial decrease that was noted between 2009 and 2010. During a September, 2011 site visit, Cowlitz PUD personnel noted that no flower heads were present on a large percentage of the thistle plants that remain in the meadow. Thistle flowers could have been consumed by elk, birds, or small mammals, or lost as the result of insect damage. No other target weed species were observed in DB-A.

The follow-up invasive plant survey along the Devil's Backbone MU 7902 Road also showed no change from 2010; the 2009 herbicide treatment (a combination of Milestone VM and Competitor in July and September) was effective in controlling Scotch broom and Canada thistle at sites DB-B and DB-C. One Scotch broom plant was observed in DB-D. Common cat's-ear remains scattered in these very small (less than 0.1 acre) sites.

Scotch broom was observed to be re-sprouting and blooming at sites on property adjacent to the Devil's Backbone MU. These sites are located on both sides of the 7902 Road immediately east of the Devil's Backbone MU boundary (Figure 20), and on both sides of the 7902 Road just south of the gate near the junction with FR 90. These areas were treated by the neighboring landowner in 2009. Weed surveys in 2010 indicated good success, but follow-up treatment would be required for full control. No signs of re-growth were evident on adjacent property at the south entry point to the Devil's Backbone that also was treated by the neighboring landowner in 2009, perhaps owing to the lower density and younger age of Scotch broom at that site.

Figure 20. Live and dead Scotch broom on the 7902 Rd. adjacent to the Devil's Backbone MU boundary.

<u>Project Works MU</u>

In the Project Works re-vegetated areas (PWMU-REV), follow-up surveys in PW-A and PW-B showed very few Scotch broom plants remaining at 2 years post-treatment with herbicides (Garlon 3A and Transline in September, 2009) and 1 year post-treatment with manual methods (digging in February and November, 2010). Plants that were noted during the May, 2010 invasive plant surveys to have survived partial removal by crews using hand tools in February, 2010, were observed during the June, 2011 surveys to have succumbed to repeat treatments in November, 2010, which completely severed the roots.

Himalayan blackberry documented in PW-C in 2010 was removed by crews using hand tools in November, 2010, but was noted to be re-sprouting in June, 2011. A few occurrences of other invasive species (Table 10) were also observed. These occurrences may have been present in previous years and not been visible due to the shrub canopy cover, or they may be new in 2011, as a result of removing the shrub canopy cover, disturbing the soil, and allowing more light penetration on this site.

Scotch broom documented in PW-D in 2010 was also removed by crews using hand tools in November, 2010. This was successful in reducing cover from the 25-50% range to the 0-5% range, but several live plants were observed in 2011, especially where their location within deadfall or dense shrubs may have prevented access with hand tools (Figure 21).

Figure 21. Live and dead Scotch broom in PW-D within deadfall and dense shrubs.

Invasive Plant Species Control

On June14, 2011, DeAngelo Brothers applied a combination of Garlon 3A, DMA4, and EDT to control Himalayan blackberry in the PW-C and to control Scotch broom in PW-D.

On June 15, 2011, DeAngelo Brothers applied a combination of Garlon 3A, DMA4, and EDT to control Canada thistle in the Devil's Backbone meadow (DB-A) as shown in Figure 20 and below in Figure 22.

Figure 22. DeAngelo Brothers controlling Canada thistle in the Devil's Backbone meadow (DBMU-11) on June 15, 2011.

PWMU-PUB Wetland Restoration

During a heavy rain event in January 2009, a natural landslide buried the PWMU-PUB wetland in mud and large woody debris (LWD). The following summer, Cowlitz PUD re-contoured the wetland, reseeded the area, and planted willow stakes. In 2010, the TCC recommended implementing a shrub enhancement project to further increase the species and structural diversity of wildlife habitat in the vicinity of this wetland.

To accomplish this objective, Cowlitz County PUD selected a mix of willow, dogwood, Nootka rose, snowberry, and ninebark, and used the Washington Conservation Corps (WCC) to plant the shrubs. Rooted stock of all species and live stakes of willow and dogwood were purchased from a nursery in Kalama, Washington, that specializes in locally-grown stock, and planted in November 2010. The WCC crew selected planting sites based on each species' moisture tolerance, so that willow and dogwood were planted in the pond shallows and pond margins, and ninebark, snowberry, and Nootka rose were planted in drier soils at slightly higher elevations around the pond.

Shrub survival was estimated during the invasive plant survey conducted on June 8, 2011. The number of live and dead shrubs observed was tallied by species, where identification was possible. Table 13 summarizes the results of the survey. It should be noted that many shrubs (both live and dead) were likely missed, owing to the variable-density planting pattern. For this reason, the calculated average survival of 57% should be considered a very rough estimate.

Table 13. Number and percent live and dead plantings observed in the vicinity of PWMU-PUB on June 8, 2011.

Stock	Total Number Planted	Shrubs and Trees Observed				
		Live		Dead		Total Number Observed
		No.	%	No.	%	
Willow	200	46	69	21	31	67
Dogwood	100	26	29	63	63	79
Nootka rose	50	2	40	3	3	5
Snowberry	50	20	83	4	4	24
Ninebark	50	11	65	6	6	17
Total Shrubs	450	105		97		202

Only three willow and four dogwood plantings were observed to have suffered browse damage. In most cases, the cause of mortality in these species was not apparent, but may have been related to hydrologic conditions. Live stakes observed in pond shallows (Figure 23) and dogwood rootstock observed in saturated soils (Figure 24) were leafed out, while most live stakes observed in saturated soils (Figure 25) were not.

Figure 23. Livestake observed in pond shallows

Figure 24. Rootstock observed in staturated soils.

Figure 25. Live stakes observed in saturated soils

Figure 26. Pacific ninebark planting

Shrubs planted in drier soils farther from the pond margin (rose, snowberry, and ninebark) were more difficult to locate than the willow or dogwood, as they did not stand out so readily from the herbaceous vegetation (Figure 24). Browse damage was observed in all three species, but did not affect survival, i.e., the mortalities that were observed did not appear to have resulted from browse.

The WCC crew also planted 370 Douglas-fir seedlings that were available following Cowlitz County PUD's Dry Creek culvert replacement project. The Douglas-fir seedlings were planted at variable densities in upland portions of PWMU-REV. The highest densities appeared to be along the south-facing slope west of PWMU-PUB (Figure 27), with lower densities on the slope east of the wetland. Counts of new plantings were complicated by the presence of Douglas fir seedlings that had been planted in previous years and others that may have colonized from adjacent mixed upland forest. For this reason, the total number of live (127) and dead (9) Douglas-fir observed in June, 2011 likely included many of the seedlings that had been planted in previous years. Although existing information does not allow for a calculation of percent survival, seedlings from several planting years (including 2010) have persisted, grown, and now range in size from about 10 to 60 inches in height, despite some evidence of browsing activity on about 10% of the smaller trees and a bright green to yellow color in many trees that may indicate low soil nitrogen. However, soil conditions are likely to improve over time, as soils builds and nitrogen-fixing species, such as red alder and soft rush (Figure 28) continue to colonize and spread.

Figure 27. Douglas-fir plantings west of PWMU-PUB.

Figure 28. Red alder and soft rush colonizing PWMU-PUB.

Public Access Monitoring

Public access surveys were conducted concurrently with invasive plant species surveys on June 8, 2011. The purpose of the surveys was to document the condition of roads, gates, and signs; evidence of authorized (i.e., non-motorized) or unauthorized (i.e., motorized) public access; and screening between the roads and adjacent habitat. The surveys included roads that lead into the Devil's Backbone MU and the Project Works MU maintenance road, shown in Figure 19 and Figure 20, respectively.

Figure 29. Tank traps on the 7901 Road in May 2009 (left) and June 2011 (right).

The 7901/01M Road leads north into the Devil's Backbone MU from Forest Road 90 (FR 90) and passes through DBMU sites 7, 8, 9, 10 and 12. The road provides access to adjacent properties via easement agreements. Cowlitz PUD allows non-motorized access. The road is not gated and no boundary signs have been installed. As of June 8, 2011, passability at the lower end was limited due to a 300-foot-long washout near the intersection with FR 90. During late 2010 or early 2011 a series of three "tank traps" or "kelly humps" located north of the Devil's Backbone MU boundary were repaired and several small trees were removed along the road margin. The road is now passable by 4-wheel drive vehicles, and tire tracks and evidence of dispersed camping (fire-rings, litter, etc.) were noted during the access survey. Conversations with the neighboring landowner indicated that they do not intend to use the road for many years. Apparently, the tank traps were repaired to allow private access and are being used for this purpose, without authorization from the landowner.

The 7901 Road passes through riparian deciduous and mid-successional conifer stands with a sparse shrub layer, and vegetation provides little screening between the road and adjacent habitat. Given recent road repairs and signs of increased activity, it may be beneficial to install gates or some other device at the property boundaries to prevent unauthorized access.

The 01M Road is passable only to ATVs or motorcycles. Alders and bigleaf maple are encroaching into the roadbed along its entire length, and the only evidence of human use was an old fire ring at the end of the road, which does not appear to have been used since the previous (2010) survey.

The 7902 Road leads south from FR 90, crossing adjacent property before turning west and entering the Devil's Backbone MU, where it passes through DBMU sites 2, 3, and 4. The adjacent property owner maintains a steel swing gate near the intersection with FR 90 and attempts to keep the gate locked, but reports that the locks are often removed in an unauthorized manner. The gate was in good repair and locked at the time of the access survey in June, 2011.

No gates or signs have been installed on the 7902 Road at either the east or south entrances to the Devil's Backbone MU. The road is in good condition, with no erosion or drainage concerns. Although a WCC crew cleared blowdown and encroaching trees in early 2010, new blowdown was observed during the June, 2011 survey and is likely to occur every year, to some extent. Mid-successional conifer stands and a sparse shrub layer provide little vegetative screening between the roadway and adjacent habitat. However, the risk of wildlife disturbance is low, due to the presence of the gate near the intersection of FR 90. No evidence of recent human use was observed.

The Project Works MU maintenance road is closed to public access, with locked gates at both the east and west ends of the road. Both gates (chain link at the east end; steel swing gate at the west end) have padlocks which are in good condition. "No Trespassing" signs installed on the gates are also in good condition. No evidence of unauthorized entry or use of Project Works MU lands was observed during the public access surveys.

5.4.5 SA Section 10.8.4 Habitat Evaluation Procedures

Implementation scheduled for 2025 (Year 17) of the Swift No. 2 License.

5.4.6 SA Section 10.8.4.2 Review of Effectiveness of WHMP

Implementation scheduled for 2025 (Year 17) of the Swift No. 2 License.

5.4.7 SA Section 10.8.3 Cowlitz PUD 2011 Annual Plan

Cowlitz PUD began preparation of the 2011 WHMP Annual Plan in December 2010.

5.5 Cowlitz PUD Terrestrial 2012 Annual Plan

5.5.1 SA Section 10.6 Cowlitz PUD Completed Implementation: Advance Purchases [Devil's Backbone Conservation Covenant]

These lands will be managed under the WHMP.

5.5.2 SA Section 10.8.1 Cowlitz PUD Development of the Wildlife Habitat Management Plan (WHMP)

The WHMP will be implemented via the 2012 Annual Plan upon FERC approval.

5.5.3 SA Section 10.8.2 Cowlitz PUD WHMP Fund

Cowlitz PUD will make approximately $17, 468 available for WHMP activities on December 26, 2012.

5.5.4 SA Section 10.8.3 Management of the Plan [Annual Plan]

Following consultation with the TCC, Cowlitz PUD will file the 2012 Annual Plan with FERC. Upon FERC approval, Cowlitz PUD will implement the 2012 Annual Plan.

6.0 Law Enforcement

6.1 SA Section 13.2.1 Law Enforcement

Throughout the year the Lewis River Basin was patrolled by a full time Washington Department of Fish and Wildlife officer, a part time Skamania County Deputy (May through October) and a full time Cowlitz County Deputy. During some periods, additional patrols were provided by other officers. For these officers the focus is protection of fish and wildlife, cultural resources, and public safety and security.

The following table presents the WDFW enforcement actions taken during the January through December 2011 toward fish and wildlife law enforcement requirements in the Lewis River Settlement Agreement.

2011 WDFW/PacifiCorp Lewis River Enforcement Statistics

Officer Name	Month, Year	BIG GAME VIOLATION	BOATING SAFETY INSP./ VIOL	COL. RIVER SALMON/ STEELHEED STAMP	FOREST PRODUCT VIOL.	FRESHWATER FISH VIOLATION	GENERAL AUTHORIY INVEST.	OFF ROAD VEHICLE INCIDENT/VIOL.	SMALL GAME VIOLATION	TRAFFIC INCIDENT/ VIOL.	TRESPASS	Monthly Total
BRANDON CHAMBERLIN (OTHER OFFICER)	Dec, 2011					1						**1**
	Nov, 2011	1 (2)		4 (16)		1	3					**27**
	Oct, 2011	2 (1)		11 (32)				3	2		(3)	**54**
	Sept, 2011	1		(7)		8 (2)	4 (1)			1		**24**
	Aug, 2011		1	(2)		9 (1)						**13**
	July, 2011		2			11 (7)	2	3		2	4	**31**
	June, 2011					6 (3)		2		2		**13**
	May, 2011					8 (4)	6	2		5 (1)		**26**
	Apr, 2011		4	1		8 (4)				2		**19**
	Mar, 2011					1	2	1		2		**6**
	Feb, 2011		1			2	1	(1)				**5**
	Jan, 2011				2							**2**
	Incident Total	**7**	**8**	**73**	**2**	**76**	**19**	**12**	**2**	**15**	**7**	**221**

7.0 FUNDING

This section presents an accounting to date of the funding obligations for the Lewis River Settlement Agreement section 7.5.

Lewis River License Implementation

Lewis River Aquatics Fund - Resource Projects

Sections 7.5, 7.5.1, 7.5.3, 7.5.3.1 & 7.7

Funding Start Date: 4/30/05

Release Date	Funds Received	Expense		Balance	Notes
12/31/05				$ 161,327.11	Contributions in 2004 dollars, adjusted for inflation.
4/30/06	$ 212,172.03				
9/30/06		$ 46,000.00			Muddy River Tributary Road Decommission - USDA FS *
12/31/06				**$ 351,804.14**	
4/30/07	$ 164,776.65	$ 80,000.00			Fish Passage Culvert Replacement - USDA FS*
8/23/07		$ 79,000.00			2007 Dispersed Camping & Day Use Road Restoration - USDA FS
9/6/07		$ 75,000.00			2007 Aquatic Funding Enhancement Projects - Cowlitz Indian Tribe*
12/31/07				**$ 312,534.84**	
4/30/08	$ 225,723.71				
7/3/08		$ 34,000.00			2008 Clear Creek Road Decommission - USDA FS
7/3/08		$ 117,000.00			2008 Muddy River Habitat Improvement - USDA FS
10/2/08		$ 43,500.00			2008 Mud Creek Enhancement - Cowlitz Indian Tribe *
12/31/08				**$ 363,297.10**	
4/30/09	$ 374,275.05				
8/20/09		$ 190,000.00			2009 NF RM 13.5 Habitat Enhancement - LCFEG*
9/16/09		$ 106,000.00			2009 Clear Creek Instream - USDA FS
9/24/09		$ 33,000.00			2009 Spencer Peak Road Decommission - USDA FS*
9/25/09		$ 41,000.00			2009 Nutrient Enhancement Pine Creek - USDA FS
12/31/09				**$ 383,851.59**	
4/30/10	$ 375,965.20				
12/22/10		$ 50,000.00			2009 Plas Newydd RM 2.0 Off-Channel Habitat Enhancement
12/31/10				**$ 730,749.57**	
1/11/11		$ 41,300.00			2010 Pepper-Lewis Side Channel Instream Habitat Restoration
1/26/11		$ 32,500.00			2010 Pine Creek Instream and Floodplain Structures for Bull Trout & Steelhead
4/30/11	$ 381,025.38				
7/21/11		$ 39,000.00			2011 USFS Muddy River Side Channel Restoration
8/19/11		$ 42,000.00			2011 USFS Lewis River Side Channel Near Muddy River Instream Habitat Restoration
9/21/11	$ 1,695.65				2009 USFS Pine Creek Nutrient Enhancement funds not used
12/31/11				**$ 989,635.96**	
		Total Spent to Date:	**$ 1,049,300.00**		
		Balance Remaining:	**$ 989,635.96**		* Project close out complete

Note: In August 2009, the Bureau of Economic Analysis (BEA) restated the index numbers in Table 1.1.9 (Implicit Price Deflators for Gross Domestic Product). The index numbers are now based on 2005 = 100. This changes the beginning adjustment number for year 2000, quarter 3.

Lewis River License Implementation
Lewis River Aquatics Fund - Bull Trout
Sections 7.5, 7.5.1, 7.5.3, 7.5.3.1 & 7.7

Funding Start Date: 4/30/05

Release Date	Funds Received	Expense	Balance	Notes
12/31/05			$ 161,327.11	Contributions in 2004 dollars, adjusted for inflation
4/30/06	$ 106,086.01			
11/30/06		$ 37,889.08		Pine Creek Nutrient Enhancement - USDA FS*
12/31/06			**$ 248,700.65**	
4/30/07	$ 164,776.65	$ 25,000.00		Pine Creek Instream & Floodplain Structures for Bull Trout and Steelhead - USDA FS
7/31/07		$ 20,000.00		Rush Creek Gravel Restoration - USDA FS
8/21/07		$ 43,150.00		2007 Pine Creek Nutrient Enhancement - USDA FS*
12/31/07			**$ 351,848.59**	
4/30/08	$ 112,861.86			
7/3/08		$ 13,578.84		2008 Panamaker Crk. Rd Close & Culvert Removal - PacifiCorp*
12/31/08			**$ 472,537.81**	
3/25/09	$ 19,269.66			Return of funds: Rush Creek Gravel Restoration - USDA FS
3/31/09	$ 23,493.72			Return of funds: Pine Creek Instream & Floodplain Structures for Bull Trout and Steelhead - USDA FS
12/31/09			**$ 531,975.39**	
12/31/10			**$ 549,524.45**	
1/26/11		$ 32,500.00		2010 Pine Creek Instream and Floodplain Structures for Bull Trout & Steelhead
12/31/11			**$ 534,154.84**	
		Total Spent to Date:	**$ 172,117.92**	
		Balance Remaining:	**$ 521,251.53**	

Note: In August 2009, the Bureau of Economic Analysis (BEA) restated the index numbers in Table 1.1.9 (Implicit Price Deflators for Gross Domestic Product). The index numbers are now based on 2005 = 100. This changes the beginning adjustment number for year 2000, quarter 3.

Lewis River License Implementation

Lewis River WHMP Fund (Fee Simple Lands)

Section 10.8.2

Release Date	Funds Received	Expense	Interest	Balance	Notes
Contributions in 2003 dollars, Adjusted for Inflation					
12/26/08	$317,725.16			$ 317,725.16	10.8.2 WHMP Fund establised: 10,085 acres funded at $27.00 / acre, adjusted for inflation
3/31/09			$ 4,386.48	$ 322,111.64	Compound interest added
12/14/09		$(320,315.17)		$ 1,796.47	2009 expenses
12/26/09	$321,888.52			$ 323,684.99	10,137 acres, including additional 52 acres for the Jackman Parcel
3/31/10			$ 10,139.86	$ 333,824.85	Compound interest added
12/31/10		$(325,852.59)		$ 7,972.26	2010 expenses
12/31/10	$354,219.00			$ 362,191.26	11,105 acres, included purchase of Saddle Dam & Swift Creek properties
3/31/11			$ 11,079.15	$ 373,270.41	Compound interest added
12/31/11		$(340,176.89)		$ 33,093.52	2011 expenses
12/31/11	$360,611.00			$ 393,704.31	11,105 acres
		Total Spent to Date:	$	(986,344.65)	
		Balance Remaining:	$	393,704.31	Funding Start Date: 12/26/08

Note: In August 2009, the Bureau of Economic Analysis (BEA) restated the index numbers in Table 1.1.9 (Implicit Price Deflators for Gross Domestic Product). The index numbers are now based on 2005 = 100. This changes the beginning adjustment number for year 2000, quarter 3.

Lewis River License Implementation
Lewis River WHMP Fund (Conservation Easement Lands)
Section 10.8.2

Funding Start Date: 12/26/08

Release Date	Funds Received	Funds Expended	Balance	Notes
				Contributions in 2003 dollars, Adjusted for Inflation
12/26/08			$ -	
12/26/09	$ 254.03		$ 254.03	10.8.2 WHMP Fund: 16 acres owned in conservation easment, adjusted for inflation
12/31/09		$ (254.03)	$ -	Expenditure for 2009
12/26/10	$ 255.18		$ 255.18	10.8.2 WHMP Fund: 16 acres owned in conservation easment, adjusted for inflation
12/31/10		$ (255.18)	$ -	Expenditure for 2010
12/26/11	$ 259.78		$ 259.78	10.8.2 WHMP Fund: 16 acres owned in conservation easment, adjusted for inflation
12/31/11		$ (259.78)	$ -	Expenditure for 2011
	Total Spent to Date:	**$ (768.99)**		
	Balance Remaining:	**$ -**		

Note: In August 2009, the Bureau of Economic Analysis (BEA) restated the index numbers in Table 1.1.9 (Implicit Price Deflators for Gross Domestic Product). The index numbers are now based on 2005 = 100. This changes the beginning adjustment number for year 2000, quarter 3.

Lewis River License Implementation

Lewis River Yale Land Fund

Section 10.1 - 10.1.1

Funding Start Date: 4/1/05

Release Date	Funds Received	Expense		Balance	Notes
12/31/05				$ 1,573,922.62	Contributions in 2003 dollars, adjusted for inflation
4/30/06	$ 1,081,853.45				Fixed prime rate nearest April 1 of each year
12/31/06				**$ 2,746,276.63**	
12/31/07				**$ 2,959,113.09**	
12/31/08				**$ 3,203,742.47**	
12/14/09		$ (486,142.13)			Jackman parcel
12/31/09				**$ 2,885,450.59**	
4/30/10				**$ 2,990,352.39**	
12/1/10	$ 5,256.44			**$ 2,995,608.83**	Interest accrued
12/21/10		$ (2,995,608.83)		$ -	Purchased Saddle Dam Property & exhausted fund.
		Total Spent to Date:	**$ 3,481,750.96**		
		Running Total:	**$ -**		

Note: In August 2009, the Bureau of Economic Analysis (BEA) restated the index numbers in Table 1.1.9 (Implicit Price Deflators for Gross Domestic Product). The index numbers are now based on 2005 = 100. This changes the beginning adjustment number for year 2000, quarter 3.

Lewis River License Implementation
Lewis River LWD Fund
Section 7.1.1

Funding Start Date: 12/26/08

Release Date	Funds Received	Funds Dispersed	Balance	Notes
				Unspent balance in any year shall be carried forward
11/25/08	$ 2,000.00		$ 2,000.00	7.1.1 Large Woody Debris Program, ILR-LWD
12/25/08	$ 10,000.00		$ 12,000.00	7.1.1 LWD projects in the mainstem below Merwin Dam
12/3/08		$ (2,000.00)	$ 10,000.00	Chilton Logging - move LWD from Swift boat launch to muddy river access road
4/1/09	$ 2,000.00		$ 12,000.00	7.1.1 Large Woody Debris Program, ILR-LWD
4/10/09		$ (2,000.00)	$ 10,000.00	Chilton Logging - move LWD for delivery to LCFEG
12/25/09	$ 10,000.00		$ 20,000.00	7.1.1 LWD projects in the mainstem below Merwin Dam
4/1/10	$ 2,000.00		$ 22,000.00	7.1.1 Large Woody Debris Program, ILR-LWD
7/1/10		$ (2,000.00)	$ 20,000.00	Chilton Logging - move LWD for delivery to USFS
12/21/10	$ 10,000.00		$ 30,000.00	7.1.1 LWD projects in the mainstem below Merwin Dam
4/1/11	$ 2,000.00		$ 32,000.00	
12/25/11	$ 10,000.00		$ 42,000.00	
	Total Spent to Date:	**$ (6,000.00)**		
	Balance Remaining:	**$ 42,000.00**		

Within 180 days after Issuance of the New License for the Merwin Project and annually thereafter, PacifiCorp shall make available in a Tracking Account up to $2,000, which may be disbursed to qualified entities to defray the costs of LWD transportation and placement in the Lewis River Basin (the "LWD Fund").

In addition, within 180 days after Issuance of the New License for the Merwin Project and annually thereafter, PacifiCorp shall contribute $10,000 to the Aquatics Fund (Section 7.5) that will be earmarked for LWD projects in the mainstem of the Lewis River below Merwin Dam that benefit anadromous fish.

Lewis River License Implementation

Swift No. 1 & Swift No. 2 Land and Habitat Protection Fund
Section 10.2, 10.2.1

Release Date	Funds Received	Interest	Expense	Balance	Notes
3/26/09				$ 3,781,881.67	Contributions in 2003 dollars, adjusted for inflation
					Fixed prime rate nearest April 1 of each year
12/26/09	$917,332.70			$ 4,699,220.37	Settlement Agreement contribution, adjusted for inflation
12/31/09			**$ (88,505.88)**	**$ 4,610,714.49**	Columbia Land Trust 2009 contract (total $110,000)
3/31/11		$130,141.43			Compound interest accrued
5/11/10			$ (21,494.12)	$ 4,722,619.62	Columbia Land Trust 2009 contract
7/13/10			$ (20,609.63)	$ 4,702,009.99	Columbia Land Trust 2010 contract (total $75,000)
11/22/10			$ (15,313.22)	$ 4,686,696.77	Columbia Land Trust 2010 contract
12/23/10			**$(667,563.00)**	**$ 4,060,941.05**	Swift Creek property purchase
1/4/11			$ (19,200.00)	$ 4,041,741.05	Rocky Mountain Elk Foundation - Swift land purchase surveys & appraisals
3/31/11		$147,127.39		$ 4,188,868.44	Compound interest accrued
4/11/11			$ (25,040.00)	$ 4,163,828.44	Columbia Land Trust 2010 contract
12/13/11			$ (51,464.50)	$ 4,112,363.94	Timber Appraisal Forest Resource Management ($5663) + Rocky Mountain Elk Foundation land acquisition ($45882.50) for property appraisal, survey, & Phase I environmental report
12/26/11	**$601,348.73**			**$ 4,713,631.67**	Settlement Agreement contribution, adjusted for inflation
			Total Spent to Date:	**$ (909,190.35)**	Funding Start Date: 3/26/09
			Running Total:	**$ 4,713,631.67**	

Note: In August 2009, the Bureau of Economic Analysis (BEA) restated the index numbers in Table 1.1.9 (Implicit Price Deflators for Gross
100. This changes the beginning adjustment number for year 2000, quarter 3.

Lewis River License Implementation
Lewis River Land Acquisition and Habitat Funds
Section 10.3, 10.3.1, 10.3.3

Funding Start Date: 12/26/12

Release Date	Expense	Interest	Balance	Notes
				Contributions in 2003 dollars, adjusted for inflation
12/21/10	$ 1,645,398.12		$ (1,645,398.12)	Purchased Saddle Dam Property.*

Total Spent to Date:	**$ (1,645,398.12)**
Running Total:	**$ -**

*** Per TCC agreement, funds were expended early for purchase of Yale Saddle Mountain Parcel. Per SA, PacifiCorp was to fund Lewis River Land fund at $1.1 million by six months after the fourth anniversary of the license; and another $1.1 million six months after the sixth anniversary of the license.**

The remaining funds will be available six months after the sixth anniversary (2014).

Lewis River License Implementation
Dispersed Camping Management Funding
Section 11.2.12

Funding Start Date: 6/26/08

Release Date	Funds Provided	Funds Dispersed	Balance	Notes
				Contributions in 2004 dollars, adjusted for inflation
6/26/08	$ 6,776.59		$ 6,776.59	Upon license issuance - USDA FS
11/13/08		$ (5,891.00)	$ 885.59	
6/16/09		$ (6,012.00)		
6/26/09	$ 6,909.69		$ 1,783.28	1st anniversary of license issuance - USDA FS
5/20/10		$ (6,053.00)	$ (4,269.72)	
6/26/10	$ 6,940.90		$ 2,671.18	2nd anniversary of license issuance - USDA FS
6/17/11		$ (9,705.49)	$ (7,034.31)	
6/26/11	$ 7,066.15		$ 31.84	3rd anniversary of license issuance - USDA FS

Total Spent to Date: $ (27,661.49)

Balance Remaining: $ 31.84

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Attachment A
ACC / TCC Comments

ACC/TCC Comment Matrix

ACC/TCC Member	Comment(s)	PacifiCorp Response
Nathan Reynolds, Cowlitz Indian Tribe	**Section 12, WHMP 2012 Annual Plan (Attachment M): Unique Area/ Habitat Management:** I am unaware that white oaks clumps need crown-competition pruning. Most white oaks are self-pruning. Dead limbs and broken limbs are part of that natural process. One aspect that makes oak habitat valuable and unique in a conifer-dominated landscape is the structural opportunity for cavity-nesting birds; made possible by rot pockets originating from dead and broken limbs. I would rather see oak management efforts directed at reduction of interspecific competition: removal of mature Douglas-fir or Bigleaf Maple that are shading oaks, pulling of all Douglas-fir seedlings within oak stands and within 5m, and treatment of Scotch Broom within oak stands. However, the Unique Area/Habitat Budget page indicates most effort will be spent removing either topping ($3,000) or falling ($3,000) competing Douglas-fir. Maybe my concern is not an issue. Please advise, and thanks for this opportunity.	PacifiCorp appreciates the comment from the Cowlitz Indian Tribe. PacifiCorp is planning on removal of interspecific competition as indicated (2012 timber harvest in management Unit 6) as well as treatment of scotch broom in 2012. We will prioritize those actions pending further discussion with the TCC regarding need for crown-competition pruning.

Attachment B

Section 14 of the Lewis River Settlement Agreement

SECTION 14: COORDINATION AND DECISION MAKING

14.1 Coordination and Decision Making. The provisions of this Section 14 describe the processes for coordination and decision making among the Parties for the implementation of the terrestrial and aquatic PM&E Measures provided for in this Agreement. As provided for in Section 14.2 below, the Licensees shall convene a Terrestrial Coordination Committee ("TCC") to coordinate implementation of the terrestrial PM&E Measures described in Section 10 (including any exhibits, schedules, and appendices related to Section 10), and shall accomplish the purposes set forth in Section 14.1.1 below. The Licensees shall convene an Aquatics Coordination Committee ("ACC") to coordinate implementation of the aquatics PM&E Measures described in Sections 3 through 9 (including any exhibits, schedules, and appendices related to those Sections), referred to below as terrestrial and aquatic PM&E Measures.

14.1.1 Purposes of the TCC. The TCC is intended to accomplish the purposes set forth below:

a. Provide a forum for coordination between the Licensees and the other Parties on terrestrial resources PM&E Measure implementation.

b. Oversee the development by the Licensees of an objective-oriented WHMP prior to the Issuance of the New Licenses.

c. Monitor implementation of that WHMP.

d. Oversee the HEP study in the 17th year after Issuance of the New Licenses, and modify the WHMP if necessary based on the HEP's results.

e. Oversee and make decisions regarding the: (1) Yale Fund; (2) the Swift Fund; and (3) the Lewis River Fund.

f. Oversee the annual budget for the WHMP.

14.2 Coordination Committees. Within 60 days after the Effective Date, PacifiCorp Energy and Cowlitz PUD shall convene the TCC and the ACC.

14.2.1 Committee Coordinators. Within 30 days after the Effective Date, PacifiCorp Energy and Cowlitz PUD each shall designate one Committee Coordinator for the TCC and one Committee Coordinator for the ACC. PacifiCorp Energy and Cowlitz PUD shall make their designations by notice to the Parties in accordance with the notice provisions in Section 16.6. The PacifiCorp Energy Committee Coordinator(s) shall be employed or retained by PacifiCorp Energy and may represent PacifiCorp Energy on the TCC and the ACC. The Cowlitz Committee Coordinator(s) shall be employed or retained by Cowlitz PUD and may represent Cowlitz PUD on the TCC and the ACC. The PacifiCorp Energy Committee Coordinator(s) shall, as their primary responsibilities, oversee the coordination and implementation of the terrestrial and aquatics PM&E Measures that are the responsibility of PacifiCorp Energy as provided in this Agreement. The Cowlitz PUD Committee Coordinator(s) shall oversee the coordination and implementation of the terrestrial and aquatics PM&E Measures that are the responsibility of Cowlitz PUD as provided in this Agreement. PacifiCorp Energy and Cowlitz PUD Committee Coordinators together shall oversee the coordination and implementation of terrestrial and aquatics PM&E Measures for which PacifiCorp Energy and Cowlitz PUD have joint responsibility as provided in this Agreement.

14.2.2 TCC and ACC Membership. Within 30 days after the Effective Date, or at any time thereafter with 30 days' notice to the Licensees, each Party, at its own discretion and cost, may designate one representative for membership on the TCC and may designate one representative for membership on the ACC and may designate one or more alternates. The Party shall make its designation(s) by notice to the Parties in accordance with Section 16.6. A Party not participating on the TCC, the ACC, or both may request, by notice to the Parties in accordance with Section 16.6, to be placed on a contact list to receive notices of committee meetings and releases of information, including annual reports and other interim reports that the TCC or the ACC may issue.

14.2.3 TCC and ACC Functions. The TCC and the ACC will:

a. Coordinate and Consult on development of plans by the Licensees as provided in this Agreement;

b. Review information and oversee, guide, and make comments and recommendations on implementation and monitoring of the terrestrial and aquatic PM&E Measures, including plans;

c. Consult with the Licensees on their respective reports prepared under this Agreement regarding implementation of the terrestrial and aquatic PM&E Measures as referred to in Section 14.2.6 below;

d. Make decisions, grant approvals, and undertake any additional duties and responsibilities expressly given to the TCC or the ACC with respect to the terrestrial and aquatic PM&E Measures;

e. Establish, among other things, (i) procedures and protocols for conducting committee meetings and deliberations to ensure efficient participation and decision making; (ii) rules for quorum and decision making in the absence of any member; (iii) alternative meeting formats as desired, including phone or teleconference; and (iv) the methods and procedures for updating committee members on interim progress of development and implementation of the terrestrial and aquatic PM&E Measures;

f. As deemed necessary and appropriate by the TCC or the ACC, establish subcommittees to carry out specified committee functions and responsibilities described in this Section 14.2.3, and establish the size of, membership of, and procedures for any such subcommittees; and

g. Discuss the protocols and the content of public information releases; provided that each Party retains the right to release information to the public at any time without such discussion.

14.2.4 TCC and ACC Decision-Making Process and Limitations. The TCC and the ACC shall make comments, recommendations, and decisions in a timely manner as provided below:

a. Each Party represented on the TCC and the ACC will have the authority to participate in all committee discussions relating to, and to provide input and advice on, decisions regarding implementation of the terrestrial or aquatics PM&E Measures;

b. The TCC and the ACC shall strive to operate by Consensus. Whether or not the TCC or the ACC has final authority over decisions on terrestrial and aquatic PM&E Measures, the Licensees and other Parties may proceed with actions necessary to implement the New Licenses or this Agreement, even though Consensus is not achieved; provided that in such cases the responsible Licensee or Licensees shall notify the Commission of the comments of the ACC or TCC members and the areas of disagreement. If the TCC or ACC does not reach Consensus, then any member of the TCC or ACC, respectively, may initiate the ADR Procedures as provided in Section 15 below.

c. Where one or more Parties have approval authority under this Agreement, Licensees shall notify the Commission of any approvals that were not obtained, include the relevant comments of the Parties with approval authority, describe the impact of the lack of approval on the schedule for implementation of PM&E Measures, and describe proposed steps to be taken to gain the approval, including dispute resolution.

d. In no event shall the TCC or the ACC increase or decrease the monetary, resource, or other commitments made by PacifiCorp Energy and Cowlitz PUD in this Agreement; override any other limitations set forth in this Agreement; or otherwise require PacifiCorp Energy to modify its three Projects' facilities without PacifiCorp Energy's prior written consent or require Cowlitz PUD to modify its Project's facilities without Cowlitz PUD's prior written consent, which consent may be withheld in the applicable Licensee's discretion.

e. At any juncture where discussion or other contact with the ACC or TCC is required by this Agreement, when requested by the Services or as required by the Agreement, the ACC or TCC Committee Coordinator, respectively, shall schedule an opportunity to discuss the relevant issue with the ACC or TCC. This event shall consist of a conference call, in-person meeting, or other appropriate forum to enable full consideration of the issue.

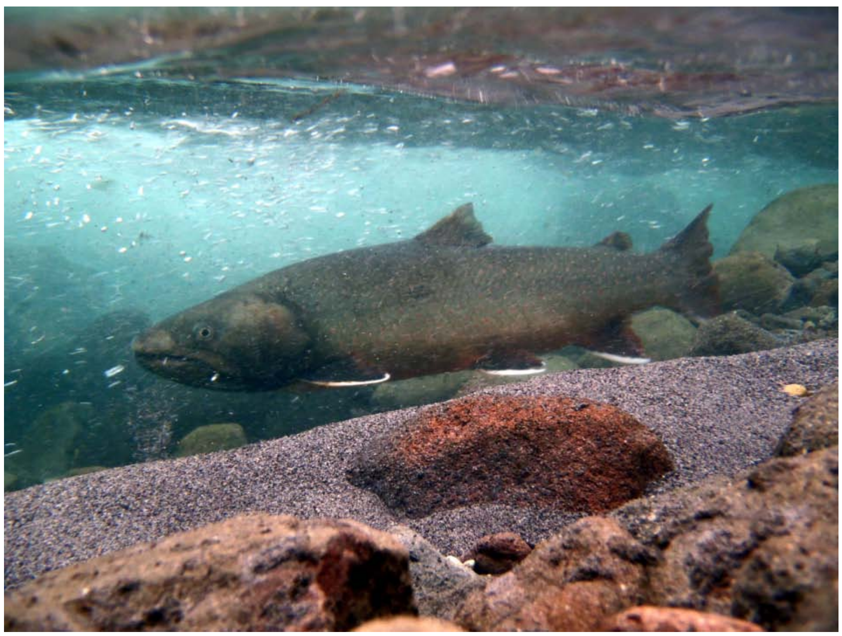
14.2.5 TCC and ACC Meetings. Commencing in the first year after the Effective Date and each year thereafter for the terms of the New Licenses, the TCC and ACC Committee Coordinators shall arrange and provide an agenda for an annual meeting of their respective committees. The TCC and ACC Committee Coordinators also shall arrange and provide an agenda for any additional meetings deemed necessary by either coordinator for a committee or at the request of any two Parties on that committee, which request shall be sent simultaneously to all members of that committee. Members of the TCC and the ACC shall be given a minimum of 30 days' notice prior to any meeting, unless otherwise agreed to by the members of the applicable committee.

14.2.6 TCC and ACC Reports
The Committee Coordinators for the TCC and the Committee Coordinators for the ACC shall prepare and file with the Commission detailed annual reports on the TCC and ACC activities, monitoring and evaluations under the M&E Plan, and implementation of the terrestrial and aquatics PM&E Measures occurring during the prior year, as well as plans for the coming year as required in this Agreement. The annual reports may also include plans and reports required pursuant to Sections 4.9.1, 7.7.1, 8.2.3, 8.2.4, 10.5, and 10.8.3. Copies of such reports will be made available to each Party. The annual reports shall be prepared in Consultation with the TCC and ACC committee members and shall be submitted to the committees for review each year, commencing after the Effective Date. Committee members shall have a minimum of 30 days to review and provide comment on a draft report before a final report is prepared and filed with the Commission. The Licensees shall submit the final report to the Commission not later than 30 days after the close of the ACC and TCC comment periods. To the extent that comments are not incorporated into the final report, an explanation will be provided in writing, and such explanation shall be included in the report.

Attachment C
Lewis River Bull Trout 2012 Annual Plan

Lewis River Hydroelectric Projects

FERC Project Nos. 935, 2071, 2111, 2213



Lewis River Bull Trout
(Salvelinus confluentus)
2012 Annual Operations Plan

North Fork Lewis River Bull Trout (Salvelinus confluentus)

PACIFICORP ENERGY
A DIVISION OF PACIFICORP

January 2012

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1.0 Introduction

Monitoring of bull trout populations in the North Fork Lewis River (Figure 1) has occurred annually since 1989. Monitoring activities are a collaborative effort between PacifiCorp and the Public Utility District No. 1 of Cowlitz County, Washington (Cowlitz PUD), federal, and state resource agencies.

On September 15, 2006, the U.S. Fish and Wildlife Service (USFWS) issued a Biological Opinion (BiOp) including associated incidental take statements for the operation of the Lewis River hydroelectric projects. Though there are no specific Annual Operating Plan requirements included within the BiOp, there are specified annual monitoring activities and reporting requirements with respect to bull trout within the basin.

On June 26, 2008 (effective date), the Federal Energy Regulatory Commission (FERC) issued new 50-year operating licenses for all Lewis River hydroelectric projects. Article 401(a) of the new licenses requires completion of an all encompassing Monitoring & Evaluation Plan (M&E Plan) for the North Fork Lewis River which was implemented beginning in 2010. Within this M&E Plan are provisions for the annual monitoring of bull trout specifically addressed by 9.6.2 of the Lewis River Settlement Agreement (SA) which states,

> "The Licensees shall include in the M&E Plan elements to monitor and evaluate PM&E Measures relating to bull trout, including specific methods and measures to be used in monitoring bull trout populations, including, but not limited to, tagging and snorkel surveys."

As required under section 2.18, Objective 18 of the Lewis River M&E Plan, the Utilities are to develop an Annual Operating Plan (AOP) that contains at minimum, specific elements to address the following four objectives:

- Provide an "unbiased" estimate of bull trout spawner abundance in Swift Reservoir.
- Collect and transport bull trout from within the Yale tailrace, Swift Power Canal or the Swift Bypass Reach and transport to an area as directed by the USFWS, to promote spawning availability and success of these fish within the Lewis River local populations.
- Monitor bull trout abundance or presence/absence in key Lewis River tributaries as identified during AOP development.
- Meet acceptable precision levels as established by the USFWS for recovery of bull trout identified during AOP development.

The AOP is developed each year in consultation with the USFWS and may adaptively change per their direction or as new scientific information becomes available.

For 2012, the following eight programs are proposed.

1. Swift Reservoir Bull Trout Migration and Survival (S) Estimate
2. Yale Tailrace Collection and Transportation
3. Swift Bypass Reach Collection and Transportation
4. Swift No. 2 Power Canal Collection and Transportation
5. Fixed Half-duplex Passive Integrated Transponder (PIT) Antenna Arrays in the Muddy River, Pine, Rush, P8, Swift and Cougar Creeks
6. Cougar Creek Spawning Population Estimate
7. Bull Trout Redd Surveys of Pine Creek Tributary P8
8. Lewis River Bull Trout Genetic Baseline - Sample Collection

A schedule of activities and estimated effort to complete each task is provided in the task descriptions below. Many of the tasks or programs are designed to estimate the number of bull trout present in either known spawning locations (e.g. Cougar Creek) or in tailrace areas (e.g. Yale). Spawner survey data are used to identify population risks (e.g., sharp declines in numbers) and, if necessary, to help develop appropriate management actions to protect these populations and stem any declines.

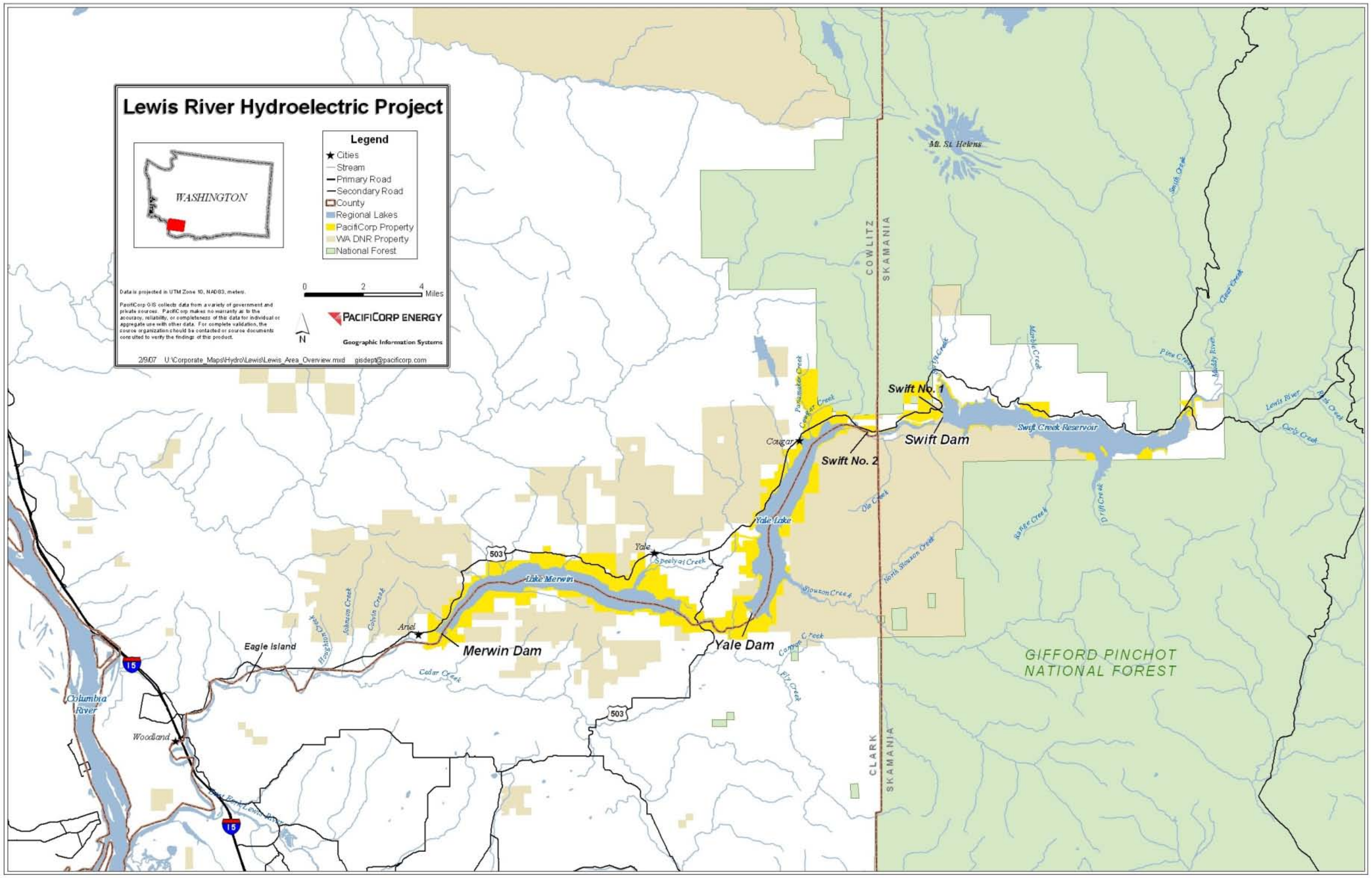

Figure 1. Map of study area

2.0 Proposed Monitoring Programs

2.1 Estimate of Bull Trout that Stage at Eagle Cliffs in the Spring/Summer and Migrate Up the North Fork Lewis River

Radio tracking studies in 1990, 1991 and 1994 revealed a pre-migrant congregation of bull trout at the Swift reservoir headwaters (Eagle Cliffs). The studies further indicated that most tagged bull trout migrated into either Rush or Pine Creeks (tributaries to the Lewis River mainstem), with Rush Creek being preferred. These behavioral patterns have allowed the use of a Peterson type estimator to document the number of migrants ascending the North Fork Lewis River (Lewis River) from the Eagle Cliffs area. Historically the annual estimate of bull trout migrants has been a joint effort between PacifiCorp, the U.S. Forest Service (USFS), the Washington Department of Fish and Wildlife (WDFW) and the USFWS.

The Peterson type estimator uses software program NOREMARK® developed by Gary White of Colorado State University to estimate migratory abundance. NOREMARK® computes estimates of population size for a closed population with a known number of marked animals and one or more re-sighting surveys (White 1996). To fulfill the marking aspect of the estimator, pre-migrant bull trout are captured and tagged in May, June, and July using tangle nets consisting of dyed green 6# monofilament, with depths of approximately 2 meters (m), varying lengths of 25 – 40 m, and varying mesh sizes of 2.5 – 7.5 centimeter (cm) stretch. With the use of boats, nets are either drifted along the bottom in the Eagle Cliffs area (Figure 2.1-1) or set and allowed to passively fish unattended for up to 10 minutes. Angling, when appropriate, may also be employed to capture staging bull trout.

Once a bull trout becomes entangled in the net, the net is retrieved and the captured bull trout is released from the net and placed in a live well. Bull trout 360 mm or larger (or as stipulated by the USFWS) will be marked with **two** chartreuse colored 3-inch Floy® anchor tags as opposed to the historical one tag (six-year Floy® tag color rotation: kelly green, white, chartreuse, florescent orange, florescent yellow and florescent pink). The goal of the two Floy® tags is to test the assumption of tag loss which currently is included within an all encompassing 10 percent reduction from the total which accounts for non-migration, mortality, and in-season tag loss. During snorkel activities, sample crews will pay special attention to the amount of chartreuse tags observed on bull trout (NOREMARK® recapture survey methodology) to directly assess any in-season tag loss.

The goal of these activities is to capture and Floy® tag 100 individual bull trout larger than 360mm. This collection goal may be adaptively managed mid-season based on extenuating circumstances or collection constraints (e.g. surveys called off based on high number of in-season recaptures or high water volume in collection area limiting the number of bull trout available to be caught for tagging purposes). Depending on unforeseen factors, the 100-fish collection goal may not be achieved from one year to the next.

In addition to floy tagging, the WDFW initiated a PIT-tagging program for captured bull trout in 2002. Historically, bull trout larger than 120mm were tagged with a full-duplex (FDX) 12mm

PIT-tag in the dorsal sinus. In 2012, to coincide with half-duplex (HDX) PIT antenna planned for installation in the Muddy River, Rush, Pine, P8 and Swift creeks, all captured bull trout larger than 120mm will be tagged with a half-duplex PIT-tag. Bull trout greater than 300mm fork-length (FL) will be tagged with a 23mm half-duplex PIT-tag in the dorsal sinus, while bull trout 120mm to 299mm fork length will be tagged with a 13mm half-duplex PIT-tag in the dorsal sinus.

Captured bull trout greater than 300mm FL will be tagged with a 23mm HDX PIT tag in the dorsal sinus. A small incision just wide enough to accommodate the diameter of the tag (appr. 3.85mm) will be made with a scalpel just anterior to the dorsal sinus and the tag will then gently be pushed toward the caudal peduncle into the sinus (Tranquilli et. al 2003). Captured bull trout less than 300mm FL will be tagged with a 13mm HDX PIT tag in the dorsal sinus by means of a syringe type PIT tag injector.

Bull trout recaptures greater than 300mm containing a full-duplex PIT tag in their dorsal sinus will be tagged with an additional half-duplex PIT tag in the sinus on the opposite side of the fish and posterior to the original FDX tagging location. This tagging location was identified during 2010 and 2011 Lewis River activities as being a suitable long-term tagging location where the two different types of PIT tag signals will not interfere with one another. If the recaptured FDX PIT tagged bull trout is less than 300mm, the dorsal sinus on the opposite side of the fish and posterior to the original FDX tagging location will be the alternative tagging location for the 13mm HDX PIT tag. PIT-tags are an alternative marking tool for captured bull trout with the intent to provide long-term survival, abundance, biological, and migratory data for individual fish.

In conjunction with tangle netting activities, PacifiCorp will weigh each captured bull trout larger than 120mm. This information will serve three purposes: First, weight-length ratios can be calculated (K factors) for each fish; secondly, this information can be compared to previous years to determine if changes in the annual average K-factor exist and whether these changes can be correlated with any population trends observed; and thirdly, with previously PIT-tagged bull trout, researchers will be able to determine individual length and weight gain which may provide information on reservoir conditions and productivity since an individual's last capture.

To determine the number of "recaptures" as required by program NOREMARK®, snorkel surveys will be conducted from August through September of the historical snorkel index areas within Rush and Pine creeks to count the number of 2012 chartreuse colored Floy® marked bull trout as well as all unmarked bull trout (Table 1). Each index area will be snorkeled a total of four times during the sampling period.

The confluences of Rush Creek, Muddy River, and Pine Creek with the North Fork Lewis River, will also be snorkeled by four biologists weekly for a total of eight surveys beginning in the middle of August (Figure 2). During each snorkel count, biologists will be equally spaced and trained to follow the methods used to snorkel the "Rush Creek Hole" to alleviate double-counting fish. To estimate migration escapement to the re-sight areas, individual survey results are combined and then averaged. A 10 percent in-season tag loss is assumed in the estimate.

In order to fulfill bull trout objective number one within the M&E Plan which states, "Provide an "unbiased" estimate of bull trout spawner abundance in Swift Reservoir", the Utilities propose to continue using PIT tag detections from fixed antenna arrays which will be placed in the Muddy River, Rush, Pine, P8 and Swift Creeks, the Floating Surface Collector (scheduled to be in operation December 26, 2012) as well as recaptures during Eagle Cliffs netting activities in the late spring and early summer to generate estimates of the following using the population structure software program MARK (White and Burham 1999):

- Probability of participating in a spawning migration
- Probability of detection during spawning
- Annual Survival (S)

Table 1. Proposed Schedule, Tasks and Effort for the Swift Reservoir Migration Estimate

Task	Schedule	Effort (person days)
Capture, mark and release pre-migrant bull trout at the head of Swift Reservoir	10 May- 15 July	20 (or as needed to mark sufficient number of migrants)
Conduct snorkel surveys in the Lewis River at the confluences with Rush, Muddy and Pine Creeks as well as historical index areas.	10 Aug – 28 Sep	72
Total Effort = 92 person days		

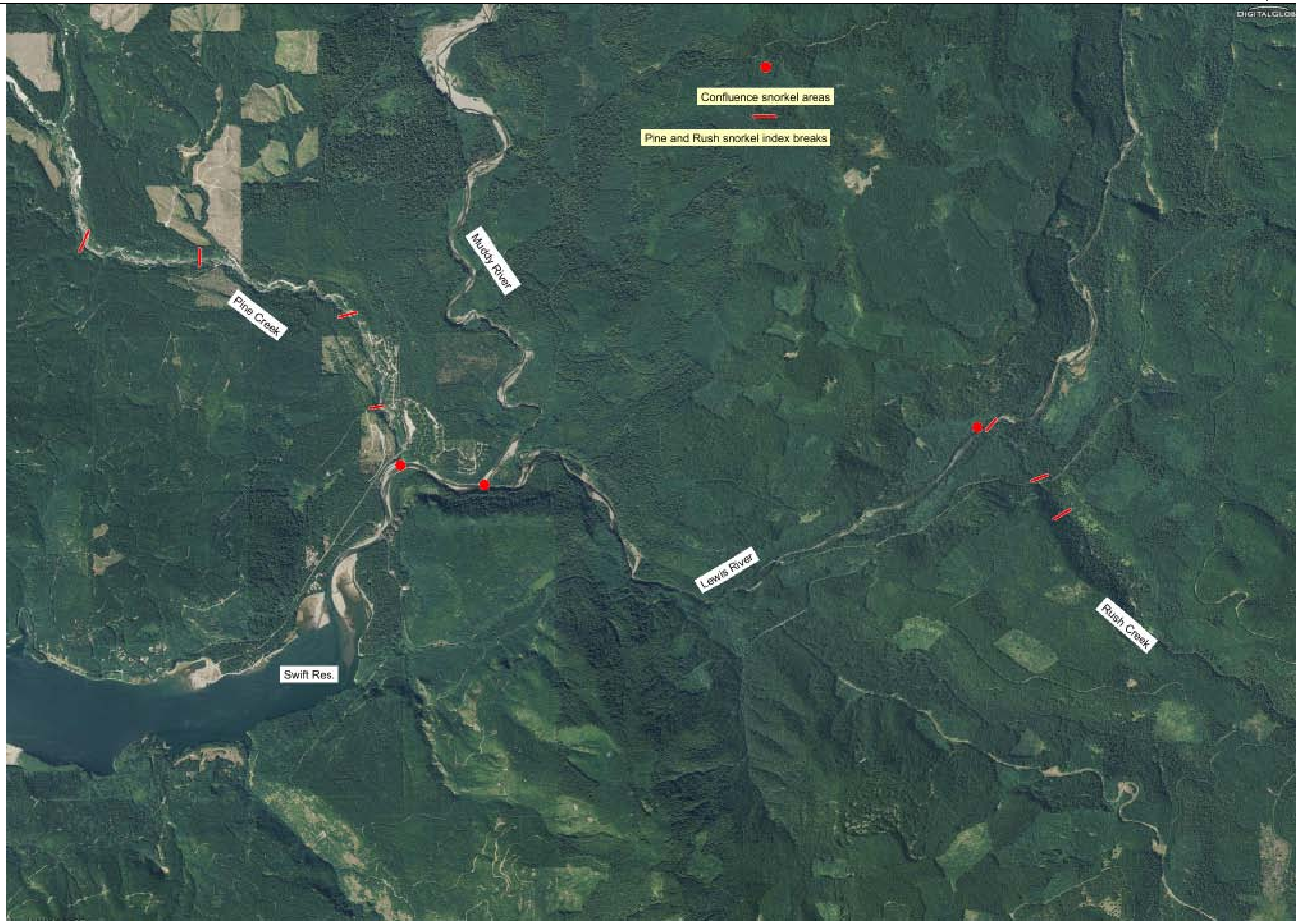

Figure 2. Snorkel sites (recapture) associated with the Swift Reservoir bull trout migration estimate.

2.2 Yale Tailrace Collection and Transportation

PacifiCorp, in cooperation with WDFW, annually collects and transports bull trout from the Yale powerhouse tailrace (Merwin Reservoir) to the mouth of Cougar Creek, a Yale Reservoir tributary. A total of 141 bull trout have been captured at the Yale tailrace since the program began in 1995. Of these, 109 have been transferred to Cougar Creek; some have been left in Merwin reservoir for various monitoring efforts, and some were mortalities.

To capture bull trout from the Yale tailwaters, monofilament tangle nets (6.5 cm stretch), trammel nets, beach seines, and angling have all been used. Tangle nets have proven to be the most effective and remain the method employed to date. Tangle nets are tied to the powerhouse wall or shoreline and then stretched across the tailrace area using a jet boat. The nets are then allowed to sink to the bottom (about 30 feet). Depending on conditions or capture rate, the nets are held by hand on one end or allowed to fish passively. The maximum time nets are allowed to fish is ten minutes.

Upon capture of a bull trout, the fish is immediately removed from the net (usually by cutting the monofilament strands) and placed in a live well. Once biological information is gathered (length, weight, general fish condition) and a PIT-tag is inserted using the same methods and protocols as described in Section 2.1 of this Plan, the bull trout is placed in either an aerated holding box, or a live cart in the stream. After collection activities are completed for the day, the captured bull trout are transported to a waiting truck with transport tank.

In past collection activities, bull trout placed into transport tank trucks were simply transported to Cougar Creek and released. As in 2011, all new Yale tailrace bull trout captures in 2012 will be transported to Speelyai Hatchery and held while rapid response genetic analysis of each individual fish is performed at the USFWS Abernathy Conservation Genetics Lab (Abernathy Lab).

All live bull trout captures will be transported to Speelyai Hatchery and held in troughs while awaiting genetic assignment. Holding troughs will be watered up with continually circulating fresh-water. Trough size is approximately seven meters (m) long by one meter wide with a water depth of 0.75 m; troughs will be covered completely with two centimeter thick plywood affixed with clamps to prohibit bull trout from jumping out. Based on past activities, the longest anticipated holding time will be 72 hours. The average time bull trout were held during 2011 was less than 48 hours. Water temperature of holding tanks is anticipated to be less than 10° C during the entire sampling period (June – August). Only like-sized bull trout will be held in the same tanks. Fish less than 250 millimeters will be held in separate troughs from larger fish.

In order to determine disposition of captured bull trout, tissue samples will be sent to the Abernathy Lab and compared to the most current Lewis River genetic baseline. Tissue samples will be analyzed using the program GENECLASS2 which assigns the sample a probability score concerning its Greatest Likelihood of Origin. Bull trout found to be genetically endemic to either the Rush or Pine Creek local population at a Greatest Likelihood of Origin analysis score of greater than or equal to .99 will be transported upstream and released into Swift Reservoir. Bull trout with a score of less than .99 to the Rush or Pine Creek local population will be released to Yale Reservoir. A sheet detailing genetic analysis of all previously captured fish that were sampled and released will be on board the sampling vessel so as to determine real-time origin of any recaptured fish. If origin of recaptured fish is known, that fish will not be held at Speelyai Hatchery, but instead taken to one of the release points described above as determined by its Greatest Likelihood of Origin analysis score. Materials and methods concerning lab genetic analysis of Lewis River bull trout can be found in the report titled "Rapid Response Genetic Analysis of Bull Trout Collected in the Lewis River, WA" (DeHaan and Adams 2011).

Netting activities begin the first week of June and continue on a bi-weekly basis until August 1, 2011 (Table 2). Frequency of visits may change due to capture efficiency or operational constraints.

Netting typically occurs between the hours of 0800 and 1200; however powerhouse generation schedules may cause netting activities to occur in the afternoon. During fish collection, powerhouse generators are taken off-line to enable deployment of nets. In years past biologists have netted for longer periods, however, capture efficiency drops substantially and very few if any fish are captured after about four hours of effort in the tailrace.

Alternative Capture Methodology

At this time no other capture method has been as feasible or efficient as tangle nets in capturing bull trout from the Yale tailrace waters. PacifiCorp continues research on possible alternative methods of effective capture and transport. However, upon investigation of each concept or pilot test conducted at other Northwestern dams, PacifiCorp has not been successful in finding a better alternative than the current method. Therefore, future capture techniques will continue to use tangle nets as the preferred method unless a better method emerges or formal fish passage is constructed at Yale dam.

Table 2. Proposed Schedule, Task and Effort for the Yale Tailrace Netting and Transportation Program

Task	Schedule	Effort (person days)
Netting and Transportation of bull trout from the Yale tailrace to Yale Reservoir	June 1 – Aug 1	16
Total Effort = 16 person days		

2.3 Swift Bypass Reach Collection and Transportation

In 1999, PacifiCorp and the WDFW began netting the Swift No. 2 powerhouse tailrace as part of Yale enhancement measures filed as part of the Yale license application with FERC in April 1999. However, due to the canal breach in May 2002 and low reservoir conditions, there was no netting at the Swift No. 2 powerhouse from 2001-2005; netting resumed in 2006. Due to the low capture numbers at Swift No. 2 (two fish in 1999 and zero since then) and large numbers of bull trout in the Swift Bypass Reach from July through October, the Swift No. 2 tailrace netting effort was relocated in 2007.

Since netting activities began in the Swift Bypass Reach in 2007, 97 bull trout have been captured and tagged (Figure 3). The Utilities propose sampling the Swift Bypass Reach in 2012 consistent with efforts conducted in 2011. Weekly or bi-weekly surveys (depending on catch rate) using a combination of tangle nets, beach seines, and angling will be performed June through August in the Swift Bypass Reach (Table 3). Biological information (length, weight, and general condition) will be recorded for all captured bull trout. In addition, tissue sampling for genetic assignment and marking with a uniquely coded 23mm HDX PIT tag will occur to assist in transportation activities. Specific tagging methods and protocol will be similar to those identified in Section 2.1 of this Plan.

In past collection activities, Swift Bypass Reach bull trout were simply released back to the point of capture. Newly implemented in 2011 with the completion of the Lewis River bull trout genetic baseline, all new bypass reach bull trout captures were transported to Speelyai Hatchery and held while rapid response genetic analysis of each fish was performed at the Abernathy Lab. Given the success of these activities, The Utilities propose to continue this protocol in 2012. Specific methods and protocol for determining transportation disposition of captured bull trout, as well as methods and protocols concerning the holding of bull trout during the rapid response genetic analysis can be found in Section 2.3 of this Plan. Materials and methods concerning lab genetic analysis of Lewis River bull trout can be found in the report titled “Rapid Response Genetic Analysis of Bull Trout Collected in the Lewis River, WA” (DeHaan and Adams 2011).

Figure 3. Area map showing location of bull trout capture sites within the Swift Bypass Reach.

Table 3. Proposed Schedule, Task and Effort of the Swift Bypass Reach Survey Program

Task	Schedule	Effort (person days)
Netting of areas within the Swift Bypass Reach	June - August	20
Total Effort = 20 person days		

2.4 Swift No. 2 Power Canal Collection and Transportation

Per the direction of the USFWS, bull trout will be collected from the Swift No. 2 power canal and transported above Swift No. 1 dam in June and July of 2012 (Table 4). As in 2011 collection activities, a total of four netting days will be conducted in June and July.

The Swift No. 2 power canal is an approximately 4600 meter-long earthen and concrete structure that begins at the Swift No. 1 tailrace and terminates at the forebay of the Swift No. 2 project (Figure 3). Water from the Swift No. 1 powerhouse directly discharges into the Swift No. 2 power canal. Theoretically, bull trout residing in the power canal are all of Swift Reservoir ancestry (likely Rush or Pine subpopulations) because the only means of bull trout passage into the canal is through the Swift No. 1 powerhouse. Therefore, all bull trout captured during netting activities will be returned upstream to Swift Reservoir.

In June and July, tangle nets and angling will be employed to capture bull trout from the power canal. Similar to Yale tailrace collection and transport activities, the Swift No. 1 and 2 powerhouses will be taken offline during sampling. Tangle nets will be stretched across the power canal and allowed to fish passively in strategic locations for a maximum of ten minutes. During this time, opportunistic angling will also be employed to target bull trout in the canal.

Upon capture, all bull trout will be freed from the sampling gear and immediately placed into a live well for assessment. After recording biological information (length, weight, and overall fish condition), sampling for genetic tissue, and insertion of an HDX PIT-tag, bull trout will be transferred to a water tank on a waiting truck for transport and release into Swift Reservoir. Specific tagging methods and protocol will be consistent with what is identified in Section 2.1 of this Plan.

Table 4. Proposed Schedule, Task and Effort for Swift No. 2 Collection and Transport program

Task	Schedule	Effort (person days)
Netting and transportation of bull trout from the Swift No. 2 power canal to Swift reservoir.	June - July	8
Total Effort = 8 person days		

2.5 Half-Duplex Passive Integrated Transponder Tag - Fixed Antenna Arrays

Fixed PIT antenna arrays will be used to further evaluate Lewis River bull trout spatial and temporal distribution, migration patterns related to spawning events, survival (S), and spawning site fidelity. Arrays will be constructed near the mouths of the Muddy River, Pine, Rush, P8, Swift and Cougar Creeks in 2012 (Table 5). Due to the greater read-range, flexible antenna construction scenarios, lower power consumption, and more affordable cost, an HDX system will be utilized in each identified stream. Depending on stream flow conditions, antennas will be placed in each creek in July and taken out of the creek the first week of November, in an attempt to capture the entire bull trout spawning time-frame.

Comparable to the system and set-up configuration employed in Rush, Pine, and Cougar Creeks in 2011, two stream-width HDX PIT tag antennas will be placed just upstream from each creek's confluence with either the North Fork Lewis River (Muddy River, Rush and Pine Creek), Swift Reservoir (Swift Creek), Yale Reservoir (Cougar Creek), or mainstem Pine Creek (P8 Creek). The antennas will be placed in a shallow area of each stream, which are conducive to higher detection efficiencies. Each PIT-tag array will have two antennas multiplexed (synchronized) and spaced approximately two meters apart. Each antenna will consist of a rubber-coated 1/0-gauge welding cable looped along the stream bottom (flat-plate design) starting from one stream bank, spanning the entire wetted-width of the stream along the stream bottom to the opposite bank, and then along the stream bottom back to the original starting point creating a large flattened oval shape. From each 1/0-gauge copper welding cable, 10-gauge copper wire will be run to an Oregon RFID RI-Acc-008B antenna tuner. Copper coax from each tuner will then connect to an Oregon RFID RI-RFM-008 reader board and data logger. The antennas at Cougar Creek will be hooked up to electricity on-site which will then be passed through a 110-volt AC to 12-volt DC converter for continuous power. The antennas at the remaining sites will be powered by two 12-volt deep-cycle batteries in parallel which will require replacement every two weeks.

Attempts to quantify fixed antenna detection efficiency will be performed during 2012 field activities. Given that each antenna site consists of two antennas multiplexed together, this detection efficiency number will most likely come from directionality detection events of tagged fish at each site (e.g. downstream antenna interrogates tagged fish as it migrates upstream, while the upstream antenna misses the interrogation. Subsequently, the upstream antenna interrogates the same tagged fish later during the downstream migration).

Table 5. Proposed Schedule, Task and Effort for fixed HDX antennae arrays in the Muddy River, Pine, Rush, P8, Swift and Cougar Creeks.

Task	Schedule	Effort (person days)
PIT-tag antenna set-up and weekly download/battery change	July-November	54
Total Effort = 54 person days		

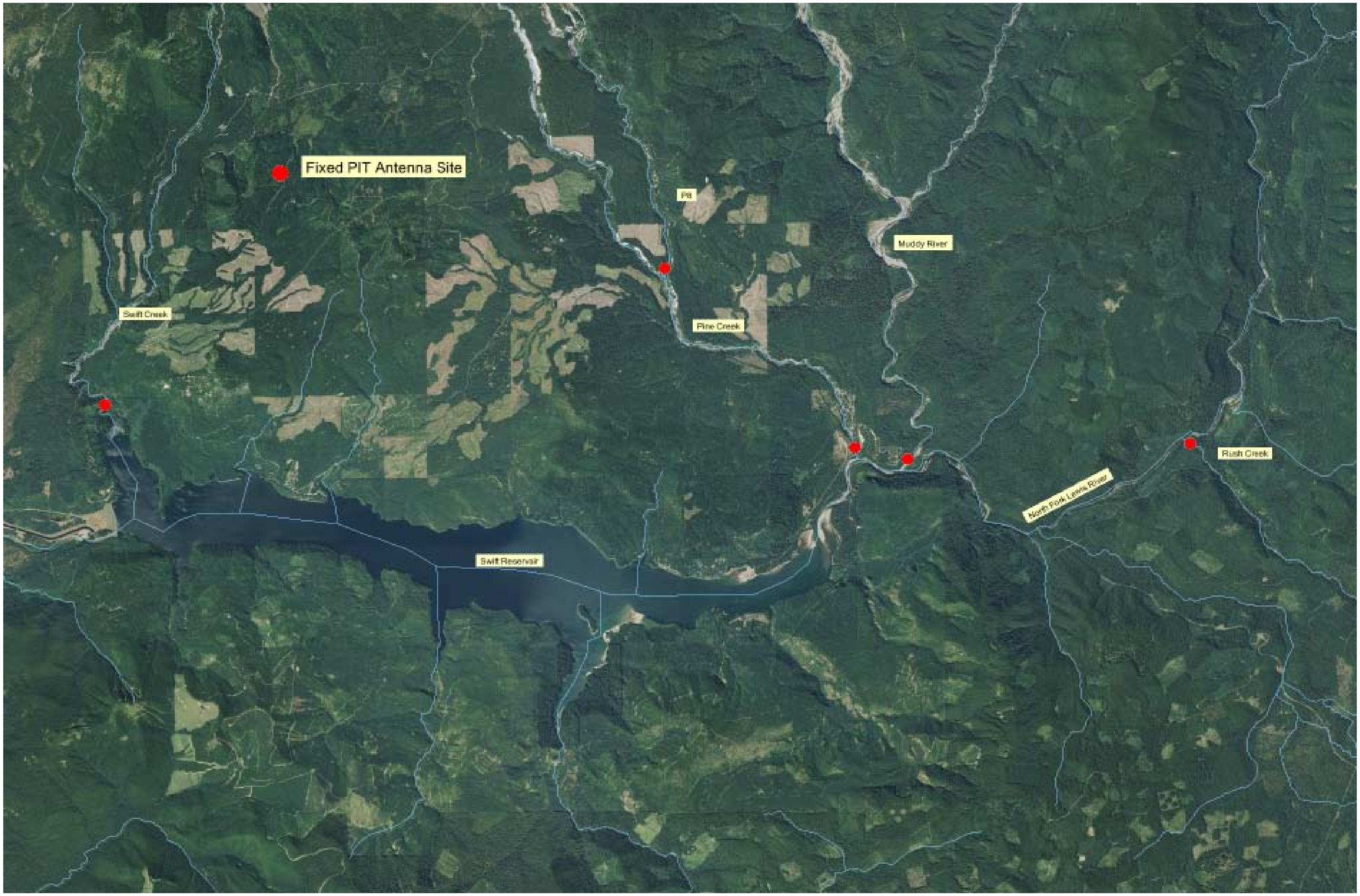

Figure 4. Fixed PIT-tag antenna sites.

2.6 Cougar Creek Spawning Estimate

Since 1979, PacifiCorp biologists, along with various state and federal agencies, have conducted annual surveys to estimate spawning escapement of kokanee (*Oncorhynchus nerka)* in Cougar Creek, a tributary to Yale Reservoir. Along with the kokanee counts, bull trout (since 1979) and bull trout redds (since 2007) are also counted, as their spawn time overlaps with that of kokanee.

Surveys are performed by one or two biologists, the entire length of Cougar Creek is surveyed – a distance of about 2400 m. Bull trout spawner population estimates have ranged from 0 to 40 fish from foot surveys (since 1979) and between 38 and 58 fish based on redd counts (since 2007). This variability is due in part to sampling error, but is also indicative of a low spawning run size. Results of Cougar Creek kokanee surveys are reported annually and provided in the Aquatic Coordination Committee/Terrestrial Coordination Committee Annual Report.

Sampling effort in 2012 will be consistent with that of 2011. Surveys will consist of weekly bull trout redd counts from September to October; or until bull trout or new redds are no longer observed (Table 5). Live bull trout within the stream will continue to be enumerated, but the surveys will focus on locating redds. Redds will be mapped using a GPS and flagged until no longer visible to avoid double counts. Along with a population estimate, these surveys will also allow for a better understanding of bull trout spawning habitat characteristics.

Table 6. Proposed Schedule, Task and Effort of the Cougar Creek Survey Program

Task	Schedule	Effort (person days)
Redd surveys of Cougar Creek (weekly)	Sep – Oct	16
Additional surveys if “new redds” are present in the creek.	November	2
Total Effort = 18 person days		

2.7 Bull Trout Redd Surveys of Pine Creek Tributary P8

The Utilities propose bull trout redd surveys within P8 (Figure 5) in 2012 in order to continue collecting abundance trend data. As during 2011 activities, surveys will be conducted within the first one mile of the stream and performed once every two weeks in September and October (Table 6). All redd surveys will be consistent with methodologies performed on Cougar Creek for bull trout (Section 2.6). Observations will also be made during P8 redd surveys to identify any adult coho (*O. kisutch)*, and any potential coho/bull trout interactions (e.g. redd superimposition).

Figure 5. Pine Creek and tributary P8.

Table 7. Proposed Schedule, Tasks and Effort for P8 bull trout redd surveys.

Task	Schedule	Effort (person days)
Bull trout redd surveys in P8	September - October	8
Total Effort = 8 person days		

2.8 Lewis River Bull Trout Genetic Baseline – Sample Collection

To further refine the established Lewis River bull trout genetic baseline, additional collection of juvenile bull trout tissue samples will occur in 2012.

To collect tissue samples from juvenile bull trout, two biologists will conduct electrofishing surveys with a Smith-Root® model LR-24 backpack electrofisher. All electrofishing activities will follow protocols as recommended by the electrofishing unit manufacturer and the National Marine Fisheries Service's (NMFS) Guidelines for Electrofishing Waters Containing Salmonids listed under the Endangered Species Act (NOAA 2000). To minimize impact and incidental injury to collected juvenile bull trout, the electrofisher will be set to straight DC current and voltage settings will be turned to the lowest output possible to capture fish.

Areas within the three known bull trout spawning streams, Pine, Rush, and Cougar Creeks will be sampled in late June to early July. The goal will be to collect 50 juvenile bull trout from within each stream. To prevent the possibility of collecting multiple fish from the same family group, a practical attempt will be made to spatially balance sampling sites.

A small clip of tissue from the upper lobe of each bull trout's caudal fin will be preserved in labeled vials filled with 95% ethanol. All captured fish will also be measured to their caudal fork and capture location recorded. Tissue samples will then be sent to the Abernathy Lab for analysis.

Table 8. Proposed Schedule, Tasks and Effort for Lewis River bull trout genetic sample collection.

Task	Schedule	Effort (person days)
Juvenile electrofishing surveys of Pine, Rush, and Cougar Creeks	June - July	6
Total Effort = 6 person days		

3.0 Reporting

An Annual Report detailing all activities and corresponding data gathered, concerning this 2012 Annual Bull Trout Operating Plan, will be included in the ACC/TCC Annual Report submitted to FERC in the spring of 2013.

4.0 References

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White, G.C. 1996. NOREMARK: Population estimation from mark-resighting surveys. Wildlife Society Bulletin. 24: 50-52.

White, G. C., and K. P. Burham. 1999. Program MARK: survival estimation from populations of marked animals. Bird Study 46:120-139.

5.0 Comments

Agency	Comment	PacifiCorp Response
Washington Department of Fish and Wildlife	We are not comfortable changing the Floy tag minimum tagging size from 360mm to 450mm based on one year's worth of migration data. We believe this number should remain the same until more data is collected.	Comment noted and changes were made to the Plan to reflect identified concerns.
Washington Department of Fish and Wildlife	We are not comfortable with the proposed tagging of bull trout 120mm to 299mm in the dorsal sinus with a 23mm HDX PIT tag. Please include documentation of this action being completed without deleterious effects to the tagged fish.	Comment noted and changes were made to the Plan. Bull trout 120mm to 299mm will be tagged with a 13mm HDX PIT tag in the dorsal sinus rather than a 23mm tag.
Washington Department of Fish and Wildlife	We do not agree that the historical index snorkel areas within Pine and Rush creeks should not be surveyed this year. It was agreed last year that the new confluence areas would be snorkeled in conjunction with the historical index areas so as to smoothly transition the data over the course of multiple years.	Comment noted and changes were made within the Plan. The historical snorkel index areas in Rush and Pine creek will be surveyed along with the confluence areas in 2012.
United States Fish and Wildlife Service	I would recommend at least one attempt to quantify efficiency of the PIT arrays, if not a routine approach to do so.	Attempts to quantify efficiency of PIT tag antennas will be conducted during the 2012 data gathering season.
United States Fish and Wildlife Service	Why is "unbiased" in quotes in the objectives on page 2? Shouldn't the objective be an unbiased estimate?	The Utilities believe the objective should be an unbiased estimate, and will do everything within their power to ensure that it is. The way the objective is written comes straight from the FERC approved Lewis River Monitoring and Evaluation Plan finalized in 2010.
United States Fish and Wildlife Service	After incorporation of the above concerns expressed by USFWS and WDFW, the USFWS believes the 2012 Plan to be adequate.	WDFW concerns were addressed within the Plan.

United States Forest Service – United States Department of Agriculture	Would it be possible to install a fixed PIT tag antenna at either the mouth of the Clear or Clearwater within the Muddy system?	It is a possibility in the future based on the number of detections at the mouth of the Muddy during 2012 activities. It is difficult to justify installing an antenna that far upstream when the number of bull trout that utilize the Muddy River is currently unknown and may be extremely low.

6.0 Bull Trout Handling Protocols 2012

2012 Handling Protocols for Lewis River Bull Trout

Eagle Cliffs Collection Site (Swift Reservoir)

All captured bull trout regardless of size will be measured to fork length, weighed, examined for general condition and signs of hooking injury, and scanned for PIT tag and or Floy tag. A small tissue clip (appr. 1 square cm) from the upper lobe of the caudal fin will also be taken from each new bull trout capture. Tagging procedures can be found in the 2012 Operating Plan.

- Newly captured bull trout ≥360mm fork length (FL) will be tagged with two (2) chartreuse Floy tags near the posterior rays of the dorsal fin.
- Captured bull trout ≥300mm FL, whether new or recapture, will be tagged with a 23mm HDX PIT tag in the dorsal sinus.
- Captured bull trout <300mm FL will be tagged with a 13mm HDX PIT tag in the dorsal sinus.
- 2012 bull trout recaptures will be examined for the presence of Floy tags as well as scanned for PIT tag retention and then released.

Swift Power Canal Collection Site (between Swift and Yale Reservoirs)

All captured bull trout regardless of size will be measured to fork length, weighed, examined for general condition and signs of hooking injury, and scanned for PIT tag and or Floy tag. A small tissue clip (appr. 1 square cm) from the upper lobe of the caudal fin will also be taken from each new bull trout capture. Tagging procedures can be found in the 2012 Operating Plan.

- Captured bull trout ≥300mm FL, whether new or recapture, will be tagged with a 23mm HDX PIT tag in the dorsal sinus.
- Captured bull trout <300mm FL will be tagged with a 13mm HDX PIT tag in the dorsal sinus.
- All bull trout, after capture and tagging, will be transported to an awaiting fish tank truck, transported upstream, and released into Swift Reservoir.

Swift Bypass Reach Collection Site (Yale Reservoir)

All captured bull trout regardless of size will be measured to fork length, weighed, examined for general condition and signs of hooking injury, and scanned for PIT tag and or Floy tag. A small tissue clip (appr. 1 square cm) from the upper lobe of the caudal fin will also be taken from each new bull trout capture. Tagging procedures can be found in the 2012 Operating Plan.

- PIT # from recaptured bull trout will be compared to on-site list of previously genetically analyzed bull trout samples in order to evaluate greatest likelihood of origin score. If the likelihood score of the recaptured bull trout is ≥ .99 for being endemic to Rush or Pine Creek origin, that fish will be transported to an awaiting fish tank truck and transported upstream for release into Swift Reservoir at the Swift Forest Campground boat launch.

- New captures will be tagged with an HDX PIT tag in the dorsal sinus and a paper-hole punch genetic sample taken from the upper lobe of the caudal fin. After tagging, captured bull trout will be transported to an awaiting fish tank truck and transported to Speelyai Hatchery and held while awaiting genetic assignment.

- After genetic assignment of held bull trout, disposition of fish will be determined by the greatest likelihood of origin score. If likelihood score is ≥.99 to either Rush or Pine Creek populations, those bull trout will be transported upstream for release into Swift Reservoir. If likelihood score is <.99 to either Rush or Pine Creeks or ≥.99 to the Cougar Creek Population, those will be transported and released into Yale Reservoir.

<u>Yale Tailrace Collection Site (Merwin Reservoir)</u>
All captured bull trout regardless of size will be measured to fork length, weighed, examined for general condition and signs of hooking injury, and scanned for PIT tag and or Floy tag. A small tissue clip (appr. 1 square cm) from the upper lobe of the caudal fin will also be taken from each new bull trout capture. Tagging procedures can be found in the 2012 Operating Plan.

- PIT # from recaptured bull trout will be compared to on-site list of previously genetically analyzed bull trout samples in order to determine release location. If the likelihood score of the recaptured bull trout is ≥ .99 assignment to Rush or Pine Creek origin, that fish will be placed in a fish tank truck and transported upstream for release into Swift Reservoir.

- New captures will be tagged with an HDX PIT tag in the dorsal sinus and a paper-hole punch genetic sample taken from the upper lobe of the caudal fin. After tagging, captured bull trout will be transported to an awaiting fish tank truck and transported to Speelyai Hatchery and held while awaiting genetic assignment.

- After genetic assignment of held bull trout, disposition of fish will be determined by the greatest likelihood of origin score. If likelihood score is ≥.99 to either Rush or Pine Creek populations, that individual bull trout will be transported upstream for release into Swift Reservoir. If likelihood score is <.99 to either Rush or Pine Creeks or ≥.99 to the Cougar Creek Population, that fish will be transported and released into Yale Reservoir.

Attachment D

Lewis River Bull Trout 2011 Annual Report

Lewis River
Hydroelectric Projects

FERC Project Nos. 935, 2071, 2111, 2213

Cougar Creek 2011

Lewis River Bull Trout (*Salvelinus confluentus*) 2011 Annual Operations Report

North Fork Lewis River Bull Trout (Salvelinus confluentus)

PACIFICORP ENERGY
A DIVISION OF PACIFICORP

January 2011

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Table 10. *Tag and biological information for bull trout captured and transported from within the Swift Power Canal – 2011.* 35

1.0 Introduction

PacifiCorp and the Public Utility District No. 1 of Cowlitz County, Washington (Cowlitz PUD) (collectively the Utilities) are involved in various bull trout (*Salvelinus confluentus*) and salmonid monitoring programs on the North Fork Lewis River in southwest Washington. These monitoring programs and this report are designed to meet requirements pursuant to Article 402 in the Utilities' Federal Energy Regulatory Commission (FERC) operating licenses for the Merwin, Yale, Swift No. 1 and Swift No. 2 hydroelectric projects as well as requirements pursuant to sections 4.9, 9.6 and 14.2.6 of the Lewis River Settlement Agreement (SA). This report and listed monitoring programs also serve to meet requirements contained in the 2006 Biological Opinion issued to PacifiCorp and Cowlitz PUD by the U.S. Fish and Wildlife Service (USFWS).

All activities are developed in consultation with the USFWS. This report provides results from programs that are either ongoing or have been completed in 2011. For methods and general descriptions of all programs please refer to the Annual Bull Trout Monitoring Plan for the North Fork Lewis River 2011 that was submitted to the USFWS, members of the Lewis River Aquatic Coordination Committee (ACC) and FERC within the ACC/TCC Annual Report in April 2011.

2.0 Study Area

Bull trout monitoring activities are performed on the North Fork Lewis River and its tributaries upstream of Merwin dam commencing at river mile (RM) 19.5 and ending at Lower Falls, a complete anadromous fish barrier at RM 72.5. The North Fork Lewis River above Merwin dam is influenced by three reservoirs created from hydroelectric facilities; 4,000 acre Merwin Reservoir, 3,800 acre Yale Reservoir, and the largest and furthest upstream 4,600 acre Swift Reservoir. From Lower Falls downstream, the North Fork Lewis is free-flowing for approximately 12 miles until the river reaches the head of Swift Reservoir at RM 60. A map of the study area for all programs is shown in Figure 1.

Bull trout are found in all three reservoirs as well as the Swift No. 2 Power Canal, with the bulk of the population residing in Swift Reservoir. Only three known bull trout spawning streams are found in the study area; Rush and Pine Creeks, tributaries to the North Fork Lewis River upstream of Swift Reservoir, and Cougar Creek a tributary to Yale Reservoir. Recent genetic analysis performed in 2011 identified three distinct local populations residing within the basin, Rush, Pine, and Cougar Creek bull trout (Dehaan and Adams 2011).

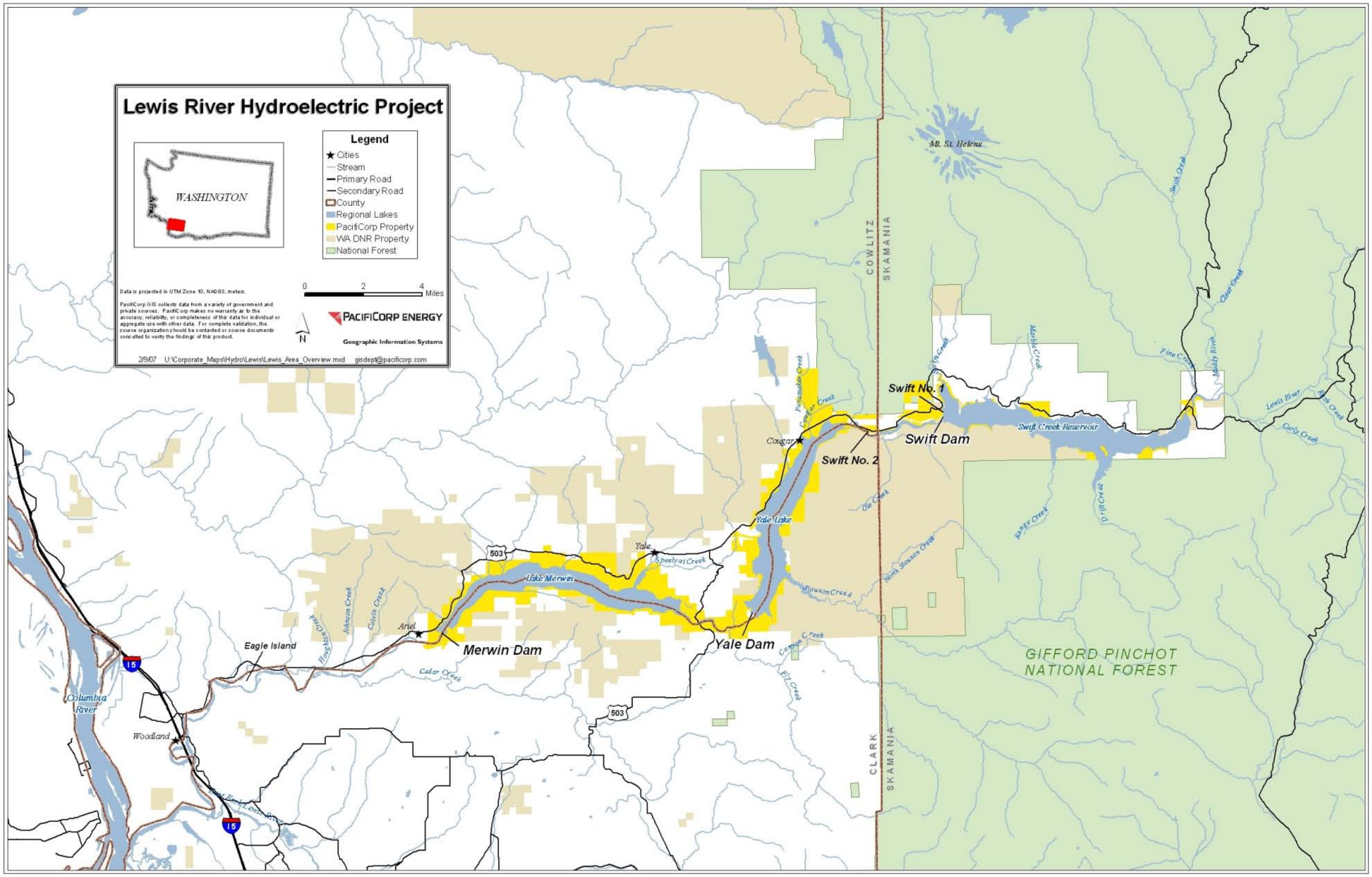

Figure 1. **Map of North Fork Lewis River study area.**

3.0 Methods and Results

During 2011 the Utilities participated in, funded or initiated eight monitoring programs.

Bull Trout Programs completed in 2011:
1. Swift Reservoir adult migration estimate;
2. Half-duplex Passive Integrated Transponder (PIT) tag antenna arrays in Pine and Rush Creeks;
3. Yale tailrace collection and transport;
4. Swift Bypass Reach collection and transport;
5. Swift No. 2 power canal collection and transport;
6. Cougar Creek spawner surveys and half-duplex PIT tag antenna array;
7. Bull trout redd surveys of Pine Creek tributary P8 and redd surveys of a portion of Pine Creek mainstem to establish "redd-life"; and
8. Lewis River genetic baseline sample collection.

3.1 FERC Project License Article 402(b) and Lewis River Settlement Agreement section 9.6 – Swift Reservoir Bull Trout Population Evaluation

3.1.1 Estimate of the Number of Staging Bull Trout that Migrated up the North Fork Lewis River from the Head of Swift Reservoir

Eagle Cliffs Bull Trout Collection (Mark):

Tangle net collection activities at the upper end of Swift Reservoir began on May 13, 2011 and continued through July 20, 2011 (Appendix A). Twelve netting days were completed during the period. A total of 99 bull trout were captured in the Eagle Cliffs area of Swift Reservoir. Of these, 86 were tagged with a white colored three inch Floy® T-bar anchor tag between the last two posterior dorsal fin-rays.

Of the 99 captured bull trout, four were too small (less than 350mm) to safely mark with a Floy® tag and nine were current year recaptures (Appendix A). In addition to the nine current year recaptures, twenty captured bull trout had Floy® or PIT (Passive Integrated Transponder) tags from previous years bringing the total capture rate of previously handled fish to twenty-nine percent (29 fish of a total of 99).

To catch Swift Reservoir staging bull trout, tangle nets are drifted along the stream bottom by means of a power boat or allowed to passively soak for up to ten minutes in slow-water areas of high bull trout concentration. Tangle nets consist of dyed green 6# monofilament, with depths of approximately two meters (m), varying lengths of 25 – 40 m, and varying mesh sizes of 2.5 – 7.5 centimeter (cm) stretch.

New in 2011, to evaluate tag retention through the mark/recapture sampling season, all Floy® tagged bull trout captures received a second same colored tag on the opposite side of the fish. It is anticipated that double-tagging bull trout captures will further refine tag-loss estimates and assumptions within the annual migration estimate. Tag retention was evaluated by snorkelers during the recapture surveys performed within Rush and Pine Creeks and during snorkel surveys of the confluence areas of Muddy River and Rush and Pine Creeks. Surveyors paid careful attention to the number of white tags observed in tagged bull trout in order to determine the proportion of bull trout missing a white tag.

All newly captured fish received Floy® (if larger than 350mm) and half-duplex (HDX) PIT tags (if greater than 250mm dorsal sinus PIT tag location, if less than 250mm but greater than 120mm pelvic girdle PIT tag location) to uniquely identify each bull trout for future reference.

The preferred tagging location for the 23mm HDX tags was the dorsal sinus. A small incision was made with a scalpel just anterior to the dorsal sinus and the tag was then gently pushed toward the caudal peduncle into the sinus (Tranquilli et. al 2003). The one concern biologists had in switching from full-duplex (FDX) to HDX tags was in the potential recapture of previously FDX PIT tagged bull trout. The concern was the possibility of FDX tag signals interfering with HDX tag signals in double PIT tagged fish.

A research study conducted by the United States Geological Survey (USGS) in 2007 identified that when the copper coils of an FDX tags came within 1 centimeter (cm) of the copper coils within an HDX tag that the FDX tag interfered with the HDX tag signal and the HDX tag was not detected by the tag reader (Compton 2007).

To alleviate the problem of tag interference between the two tag types in double-tagged bull trout, biologists needed an additional tagging location. The ventral musculature posterior to the pelvic girdle was identified and utilized as an alternative long-term tagging location for recaptured bull trout previously tagged in the dorsal sinus with an FDX tag. Biologists at the USFWS Columbia River Fisheries Program Office have been tagging fluvial-sized bull trout with 23mm HDX tags in this area for the past couple of years with good success (pers. comm. Marshall Burrows USFWS). Another tagging location was identified during 2010 activities of previously FDX tagged bull trout if the FDX tag location was known, this being the dorsal sinus on the opposite side of the bull trout from where the FDX tag was inserted. To date, this location has been utilized with no known interference.

Along with the tagging activities, all captured bull trout (minus same year recaptures) were measured to their caudal fork and, when feasible, weighed to the nearest gram. Recording bull trout weights is a data collection activity that was first implemented in 2008 and, along with fork lengths, will be used to assess the condition factor (K-factor) (Fulton 1902) of bull trout residing in Swift Reservoir. When available, this biological information will be recorded with each fish captured and individual metrics will be compared with each recapture to evaluate trends in reservoir productivity and how this pertains to bull trout behavior.

Pine and Rush Creek Snorkel Surveys & Snorkel Surveys of the Confluence areas of Muddy River, Pine, and Rush Creeks with the North Fork Lewis River (Recapture)

Historically, to satisfy the recapture portion of the mark/recapture migration estimate, snorkel surveys have typically only been conducted in Rush and Pine Creeks and a portion of the North Fork Lewis River known as the “Rush Creek hole”. This area is thought to be used as a staging area for bull trout ascending Rush Creek and is approximately 60 meters (m) long, 12 m wide and 3 m deep. It is located at the confluence of Rush Creek and the North Fork Lewis River. Newly implemented during the 2011 field season, and in conjunction with the historical Pine and Rush tributary snorkels, the confluence areas of Muddy River, Pine, and Rush Creeks with the North Fork Lewis were also snorkeled for migrating bull trout. It was anticipated that the confluence areas would hold a greater number of migratory bull trout available for resight thus increasing the sample size from the historical tributary index areas.

Snorkel surveys of index areas within Pine and Rush Creeks occurred six times between August 17 and October 5, 2011 (Table 1). Snorkel surveys of the three confluence areas occurred weekly for a total of eight times from August 9 to October 7, 2011 (Table 2).

Bull trout counts in Rush Creek occur within two index areas, one from the mouth (including the Rush Creek hole) upstream to the Forest Service Road (FR) 90 Bridge and the other for approximately 1000 m upstream from the FR 90 bridge (about RM 0.85). On Pine Creek, the survey area is limited due to accessibility so three index areas are typically sampled between RM 2.0 and 4.5 (Figure 3).

Table 1. 2011 bull trout snorkel survey results for Rush and Pine Creek tributary snorkels (recapture)

Survey Date	Number of Bull Trout Observed				Total	% of Total with Mark
	Rush Creek (including Rush Hole)		Pine Creek			
	Tagged	*Untagged*	*Tagged*	*Untagged*		
17-Aug	13	41			54	24
25-Aug			3	9	12	25
31-Aug	9	39			48	18
12-Sep			4	12	16	25
28-Sep	2	11			13	15
5-Oct			0	4	4	0
TOTAL	24	91	7	25	147	21
Total Marked Observations					31	
Total Unmarked Observations					116	

Snorkel surveys of the Muddy, Pine, and Rush confluence areas began upstream of each confluence in the North Fork Lewis and continued downstream until bull trout were no longer observed, usually a distance of approximately 100m. Given the short distance between the mouth of Pine Creek and the Muddy River, this area was also surveyed for bull trout during each confluence survey day (Figure 3).

Table 2. 2011 bull trout snorkel survey results for the Muddy River, Rush and Pine Creeks confluence areas with the North Fork Lewis River (recapture).

Date	Location	# marked	# Unmarked	Total	% of total with mark
19-Aug	Pine, Rush, Muddy confluence areas	20	81	101	20
26-Aug	Pine, Rush, Muddy confluence areas	12	38	50	24
1-Sep	Pine, Rush, Muddy confluence areas	13	54	67	19
9-Sep	Pine, Rush, Muddy confluence areas	4	23	27	15
16-Sep	Pine, Rush, Muddy confluence areas	10	35	45	22
23-Sep	Pine, Rush, Muddy confluence areas	1	12	13	8
30-Sep	Pine, Rush, Muddy confluence areas	3	31	34	9
7-Oct	Pine, Rush, Muddy confluence areas	5	31	36	14
TOTAL	**Pine, Rush, Muddy confluence areas**	**68**	**305**	**373**	**18**

During each snorkel survey all bull trout were enumerated (Table 1 and Table 2). Care was taken to determine the presence of any white Floy® tagged bull trout, and due to the current Floy® tag retention study, biologists also recorded any white Floy® tag loss (i.e. a bull trout with only one white tag as opposed to two). During the eight confluence and six tributary snorkel surveys, bull trout missing white Floy® tags were routinely observed. Given individual tagged fish cannot be distinguished during each snorkel survey, cumulatively counting tag-loss during subsequent surveys would be erroneous. The only way to accurately express tag-loss without the fear of double-counting is to record the number as a peak tag-loss count. Peak tag-loss was observed on October 7, 2011 during the final confluence snorkel survey when three bull trout were observed with only one white Floy® tag (3.5%, 3 lost tags/86 total tags).

The Swift Reservoir bull trout migration data was analyzed and a migration estimate obtained using program NOREMARK®. NOREMARK® computes an estimate of population size for a closed population with a known number of marked animals and one or more re-sighting surveys (White 1996). Program NOREMARK® utilizes four mark-resight estimators of population abundance; for all four estimators, the marked fish are assumed to have been drawn randomly from the population, i.e. the marked fish are a representative sample of the population (White 1996).

For 2011, if only data from the historical tributary snorkel areas are utilized, 364 adult bull trout (95% Confidence Limit (CL) 278-502) were estimated to have migrated upstream in the early fall from the Eagle Cliffs area of Swift Reservoir to the Rush Creek hole, Rush or Pine Creeks (Figure 2 and Table 3). When the migration estimate is derived utilizing data collected during Muddy River, Rush, and Pine Creek confluence snorkels, the estimate of adult bull trout that migrated upstream from Eagle Cliffs is 436 [95% Confidence Limit (CL) 362-539] (Table 3). While the combined tributary and confluence numbers generate an estimate of 414 [95% Confidence Limit (CL) 354-493].

A key assumption within the NOREMARK® mark/recapture estimate is that each tagged individual has an equal probability of being "recaptured" and counted during recapture activities (closed population). Being iteroparous, bull trout have the ability to migrate and spawn one year and not the next and as such, captured individuals tagged in the Eagle Cliffs area of the reservoir may not migrate upstream to the recapture survey areas after release. Currently, the rate associated with tagged non-migrating bull trout in Swift Reservoir is unknown. It is assumed that the rate of non-migration fluctuates from one year to the next and is most likely closely related to size of fish and reservoir productivity. Thus, care should be taken during evaluation of this migration estimate, as this variable non-migration rate may bias migration abundance estimates. A 10% in-season Floy® tag loss is assumed within the current estimate. At this time, an in-season mortality rate is unknown and therefore unaccounted for.

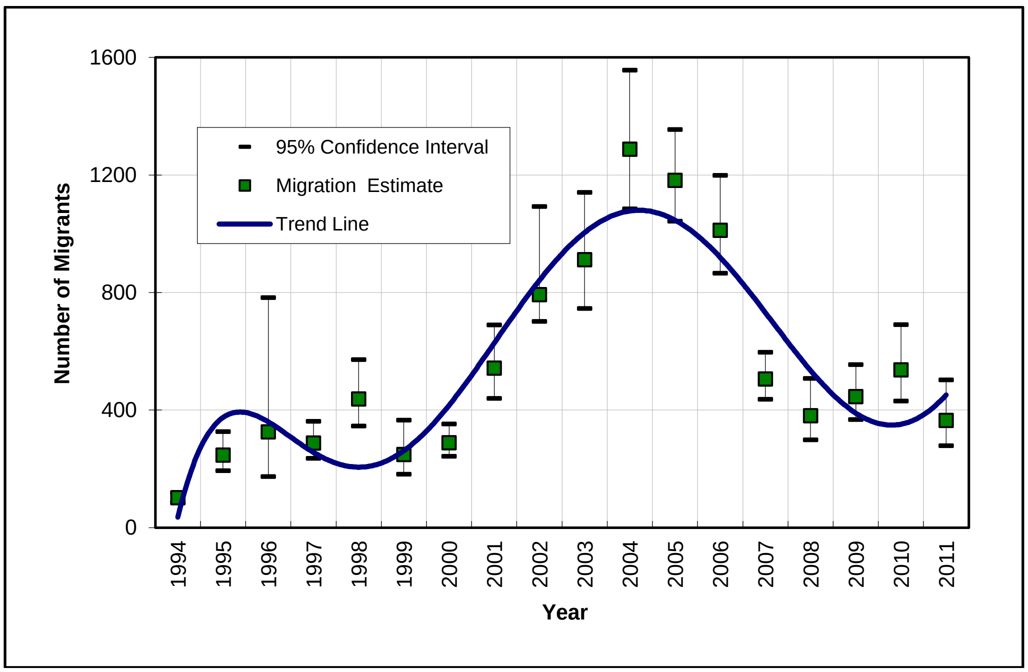

Figure 2. Estimates of bull trout that migrated from Swift Reservoir up the North Fork Lewis River and its tributaries for the years 1994 through 2011. (1994-2000 Peterson Estimator, 2001- 2011 Program NOREMARK®, Smith 1996)

Table 3. Tabular data of Swift Reservoir bull trout mark-recapture migration estimates for 1994 - 2011. (1994-2000 Peterson Estimator, 2001-2011 Program NOREMARK®, Smith 1996)

Year	Lower Bound (95% CL)	Upper Bound (95% CL)	Migration Estimate
1994	85	118	101
1995	193	326	246
1996	173	782	325
1997	235	361	287
1998	345	571	437
1999	181	365	248
2000	242	352	288
2001	439	689	542
2002	701	1092	792
2003	745	1140	911
2004	1084	1556	1287
2005	1042	1354	1181
2006	865	1198	1011
2007	436	596	505
2008	298	507	380
2009	367	554	445
2010	430	690	536
2011 (tribs.)	278	502	364
2011 (confluences)	362	539	436
2011 (tribs and conflu. combined)	354	493	414

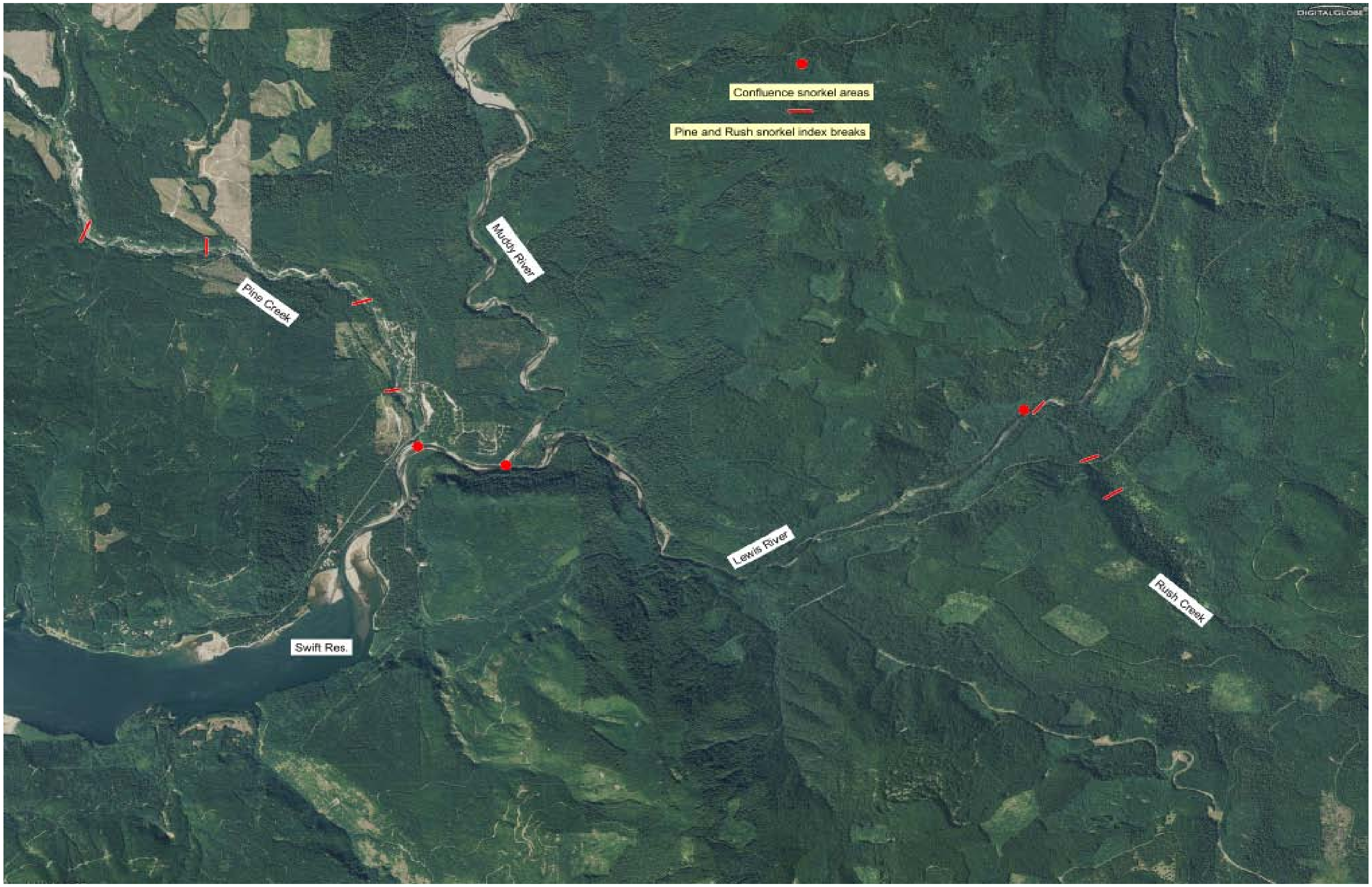

Figure 3. Snorkel sites (recapture) associated with the Swift Reservoir bull trout migration estimate.

3.2 Lewis River Passive Integrated Transponder Tag Antenna Arrays

3.2.1 Evaluation of Swift Reservoir Bull Trout through the use of Stream-Width Half-Duplex Passive Integrated Transponder Antennas in Rush and Pine Creeks

In conjunction with the new implemented half-duplex PIT tagging efforts of all captured bull trout in 2011, stream-width half-duplex PIT tag antennas were placed in Rush and Pine Creeks near their confluence's with the North Fork Lewis River in the late summer thru fall time period (Figure 4). The remote PIT antenna array in Pine Creek was stream-spanning and located in a shallow riffle approximately 300 meters upstream from the confluence with the North Fork Lewis River. The Rush Creek antenna array was also stream-spanning and located in a shallow run approximately 250 meters upstream from the confluence with the North Fork Lewis River.

Each antenna site consisted of two antennas (for directionality) that were multiplexed (synchronized) and spaced approximately two meters apart. Each antenna consisted of a rubber-coated 1/0-gauge welding cable looped along the stream bottom (flat-plate design) starting from one stream bank, spanning the entire wetted-width of the stream along the stream bottom to the opposite bank, and then along the stream bottom back to the original starting point creating a large flattened oval shape. From each 1/0-gauge copper welding cable, 10-gauge copper speaker wire was run to an Oregon RFID RI-Acc-008B antenna tuner unit. Copper twinax was then run from each tuner unit to an Oregon RFID RI-RFM-008 reader board and data logger. The antenna reader board and data logger were located in secure Joboxes near the stream bank and were powered by two large 12-volt deep-cycle marine batteries run in parallel. Batteries were exchanged with fully-charged replacements every two weeks.

A total of 109 bull trout were captured, tagged with an HDX PIT tag, and then released into Swift Reservoir. Of the 109 HDX tagged bull trout, 88 were Eagle Cliffs captures, 15 were captured and transported from the Swift Bypass Reach in Yale Reservoir, five were captured and transported from the Swift Power Canal, and one was captured and tagged at Swift Creek. Of the 88 HDX tagged Eagle Cliffs captures, twenty were previously handled and already contained a full-duplex PIT tag and so were double-tagged.

Figure 4. Half-duplex stream-width PIT tag antenna locations in the Upper Lewis River Basin – 2011.

Pine Creek Antenna
The Pine Creek HDX PIT tag antenna was constructed, placed in the stream, and powered up on July 26, 2011. The antenna ran continuous, except for a 53-hour power loss from September 6 through 9, 2011 due to a broken battery connector. After repair, the antenna continued to operate until taken out of the creek on November 4, 2011 (99 days of operation).

During this time, 56 unique detection events (Figure 5) were recorded on the Pine PIT tag antenna data logger. Each time a tagged bull trout came within the detection zone on the antenna (average zone area of 46 square centimeters during study time-period) the antenna data-logger recorded the tag identification number, time and date, and which of the two antennas at the site recorded the interrogation. A detection event consisted of one or more consecutive interrogations, as the tagged fish oftentimes would move upstream and downstream within the detection zone at numerous intervals within very short time-periods (seconds). To break the numerous detections into detection events, only the initial detection at the downstream antenna and the last detection at the upstream antenna would be recorded (or vice versa for a downstream migration), this helped to refine the data as well as identify direction of travel of the interrogated tagged bull trout.

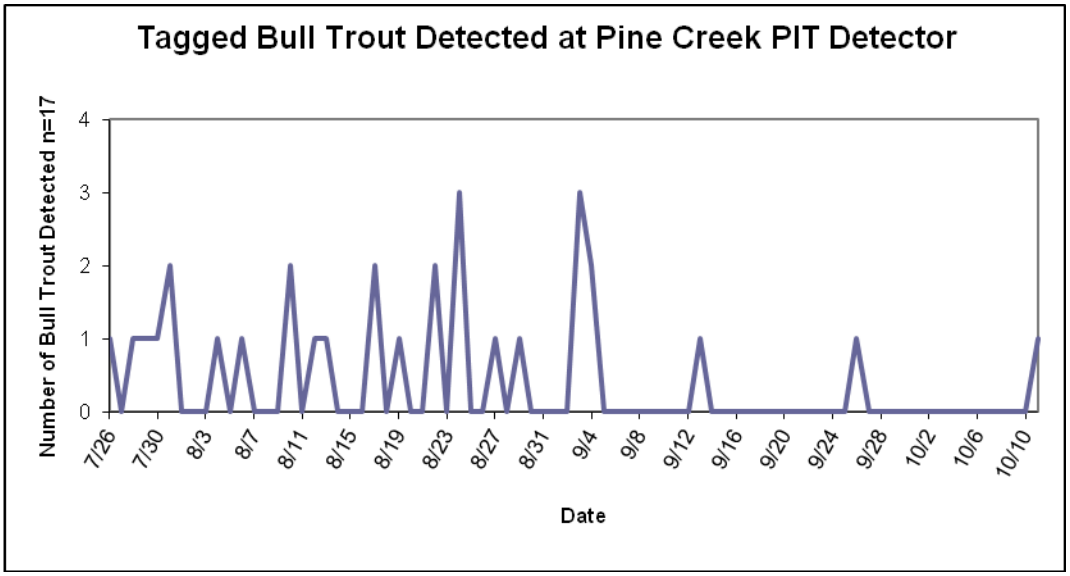

Figure 5. Time-lapse detections at the Pine Creek HDX PIT tag detector– 2011.

When analyzed, the 56 detection events were found to be seventeen individual bull trout. Seven of the seventeen interrogated bull trout migrated upstream past the antenna and then back downstream more than once during the study period. Ten of the seventeen interrogated fish made only one migration past the antenna. The most migrations by an individual were three, while the average was 1.5. Average time spent in the creek for interrogated bull trout during the study time-frame was 4.5 days with the longest a tagged fish was recorded residing above the detector before moving back downstream was thirteen days. Many bull trout detected moving upstream were not subsequently detected moving back downstream out of the system. Non-detection of bull trout migrating back downstream was either a function of a misread by the antennas, the bull trout still residing upstream after the antennas were taken out, tag failure/tag loss, or the fish perished while upstream.

Of the seventeen bull trout detected at the Pine Creek antenna, fourteen were from capture and tagging efforts in the Eagle Cliffs area while the remaining three were captured and tagged in the Swift Bypass Reach and transported upstream and released into Swift Reservoir. Four of the seventeen individuals detected were also double-tagged in the dorsal sinus with both a full-duplex and a half-duplex PIT tag.

The size distribution of migrating detected bull trout in Pine Creek in 2011 is illustrated in Figure 6. Only three of the seventeen bull trout detected in Pine Creek were less than 540 mm with the smallest detected fish having a fork length of 414. The average size of bull trout detected moving upstream past the Pine Creek antenna during historic spawn time (September 15 through October 15) in 2011 was 593 mm.

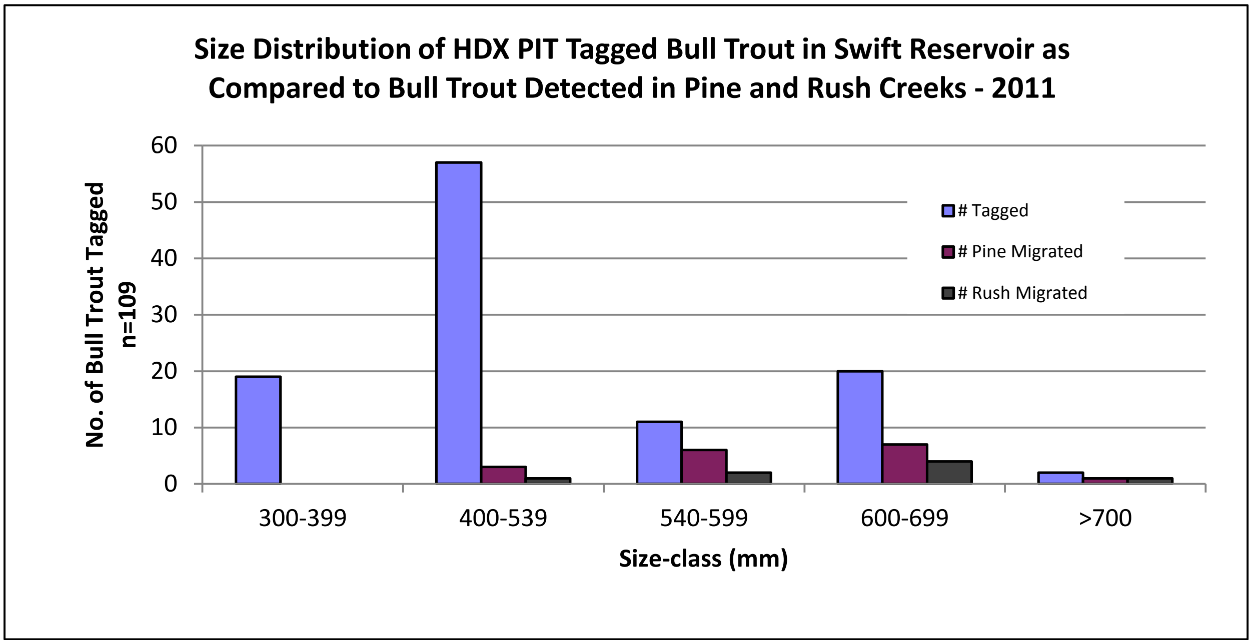

Figure 6. **Size distribution of HDX PIT tagged bull trout in swift reservoir as compared to bull trout detected in Pine and Rush Creeks in 2011**

Rush Creek Antenna

The Rush Creek half-duplex PIT tag antenna was constructed and powered up on August 5, 2011. Except for a 32.5-hour power loss from September 15 through 16, 2011 due to a battery that was not fully charged, the antenna ran continuous until removed from the creek on October 27, 2011 (83.5 days of operation). During this time 32 unique detection events were recorded comprising eight individual bull trout. Five of the eight bull trout detected during the study time-frame made multiple migrations upstream and back downstream past the two antennas. The most migrations by an individual were four with the average being 1.6 (Figure 7). Similar to the Pine Creek antenna, many of the individuals detected during their upstream migration were subsequently not detected moving back downstream. Non-detection of bull trout migrating back downstream was either a function of misread by the antennas, the bull trout still residing upstream after the antennas were removed, tag failure/tag loss, or the fish perished while upstream.

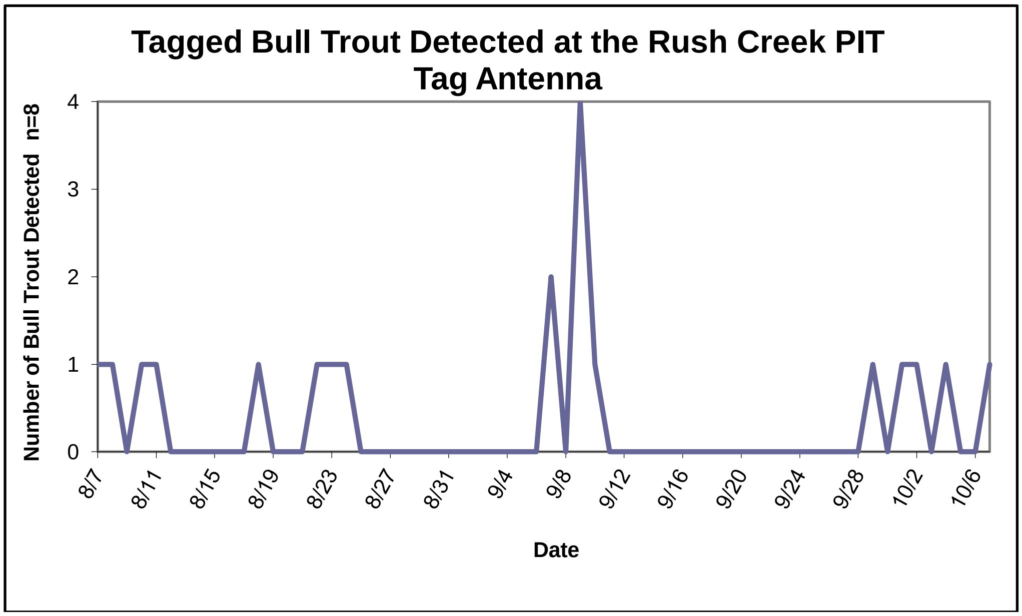

Figure 7. Tagged bull trout detected at the Rush Creek PIT tag antenna - 2011

Of the eight individual bull trout detected moving past the Rush Creek PIT antenna, seven were captured and tagged in the Eagle Cliffs area while the remaining one was captured and tagged in the Swift Bypass Reach in Yale Reservoir and transported upstream and released into Swift Reservoir. Of the eight individuals detected, five were double-tagged in the dorsal sinus with both a full-duplex and a half-duplex PIT tag.

The size distribution of migrating bull trout detected in Rush Creek in 2011 is illustrated in Figure 7. The smallest bull trout interrogated at the Rush Creek PIT antenna was 540 mm. The average size of bull trout detected moving upstream past the Rush Creek antenna during historic spawn time (September 15 through October 15) in 2011 was 628 mm.

Of note during 2011 PIT antenna activities was the size of bull trout that migrated up the spawning tributaries during the fall as compared to the size of bull trout captured and tagged during Eagle Cliffs collection activities in the spring. 86 total bull trout were tagged with a white Floy® during Eagle Cliffs collection activities in 2011 (tagged with an HDX PIT tag along with the Floy® tag). Of the total tagged, 59 were less than 539mm (69%); of these, only three were detected moving up a spawning tributary (Pine Creek). 27 of the total tagged (n=86) were greater than 540mm (31%), and of these, 18 were detected moving up Pine or Rush Creek (Figure 8).

The 86 white Floy® tagged bull trout were the “mark” group from which the Swift Upstream Migration Estimate was derived. Historical “recapture” areas are index sites within the spawning tributaries (Pine and Rush Creeks) as well as the Rush Creek Hole in the Lewis River mainstem.

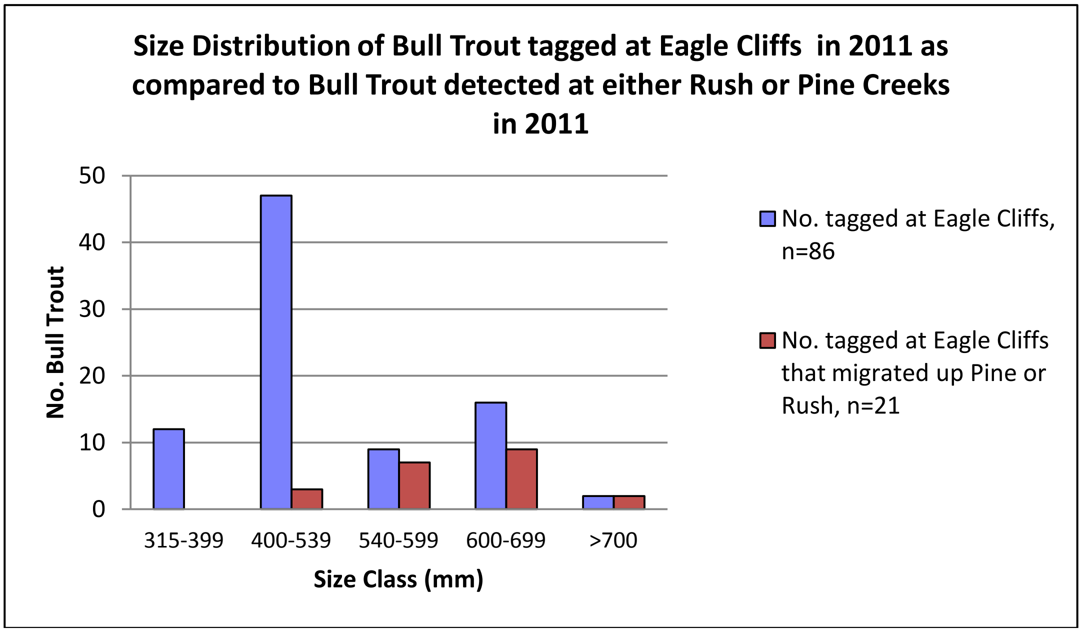

Figure 8. Size distribution of bull trout tagged at Eagle Cliffs in 2011 as compared to bull trout detected at either Rush or Pine creeks in 2011

3.2.2 <u>Evaluation of Yale Reservoir Bull Trout through the use of a Stream-Width Half-Duplex Passive Integrated Transponder Antenna in Cougar Creek</u>

To further evaluate bull trout residing in Yale Reservoir, PacifiCorp installed a stream-width HDX PIT tag antenna system in Cougar Creek in 2010. This antenna remained powered up through 2010 and into the 2011 field season. This antenna system allowed for direct evaluation of the contribution of bull trout captured in the bypass reach during the summer months as well as bull trout captured and transported from the Yale tailrace in Merwin Reservoir, and their subsequent migration up Cougar Creek in the summer and fall. The antenna also allowed PacifiCorp to evaluate bull trout migration periodicity and size at migration from individuals tagged and migrated from the same year.

Due to the greater read-range, flexible antenna construction scenarios, lower power consumption, and more affordable cost, an HDX system like the antennas located in Pine and Rush Creek were utilized. The antenna in Cougar Creek was constructed in the same manner as discussed in Section 3.1.2 of this Report in every way with one exception; it was powered by continuous on-site 110-volt AC power passed through an AC to DC converter, rather than 12-volt deep-cycle batteries.

Thirteen individual bull trout were detected moving past the Cougar Creek PIT antenna in 2011, five were captured, tagged, and transported from within the Yale Tailrace in 2011. Six were captured and tagged from areas within the Swift Bypass Reach in 2010, and two were captured and tagged from areas within the Swift Bypass Reach in 2011.

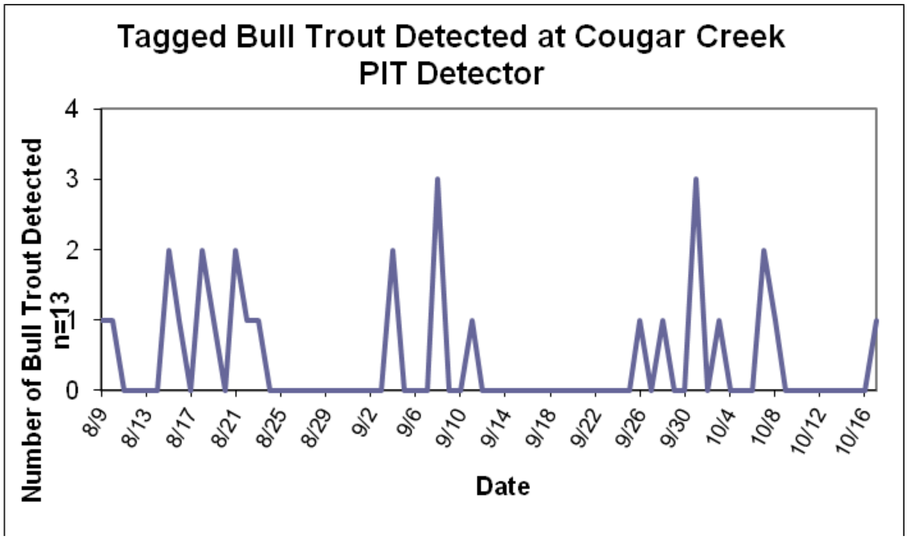

Figure 9. Tagged bull trout detected at Cougar Creek PIT detector.

The first detection of a bull trout moving upstream occurred on August 9, 2011 and the last detection of a bull trout moving downstream out of the system occurred on October 17, 2011 (Figure 9). To further analyze Cougar Creek bull trout migration patterns, all distinct upstream and downstream migrations for each detected individual were recorded - similar to Pine and Rush creek evaluations. A migration was recorded if an individual was detected by one of the two antennas as it moved upstream and then subsequently detected by one of the two antennas as it moved back downstream. Forty-seven migration events were recorded; five of the thirteen fish detected made more than one complete migration into and out of Cougar Creek during the August 9 through October 17, 2011 time-period. The average number of complete migrations performed by detected bull trout in 2011 was 1.6 which was less than what was observed in 2010 (2.25). The most migrations by an individual in 2011 were four.

Five of the thirteen detected bull trout in Cougar Creek were not detected at either antenna moving back downstream on their last recorded migration. At this time, the final disposition of these fish is unknown. It may be they succumbed to predation, lost their tag, were spawning mortalities, stayed in Cougar Creek after antennas were removed, or were undetected due to high water as they emigrated past the antennas. In order to determine the final disposition of these fish, they will need to be collected at some point during future activities.

The average time tagged bull trout spent in Cougar Creek upstream of the PIT tag antennas during upstream migrations was 11.7 days. The most time spent by an individual fish in the confines of the stream during the migration period was thirty days. This bull trout completed two migrations during that time.

The size distribution (FL) of bull trout tagged with a half-duplex PIT tag in the Swift Bypass Reach in 2011 and subsequently returned to Yale Reservoir is shown in Figure 10. Of interest is the lack of 2011 captured and tagged fish that subsequently recruited to Cougar Creek after release. Only two of the seventeen released fish were interrogated moving upstream past the Cougar Creek antennas.

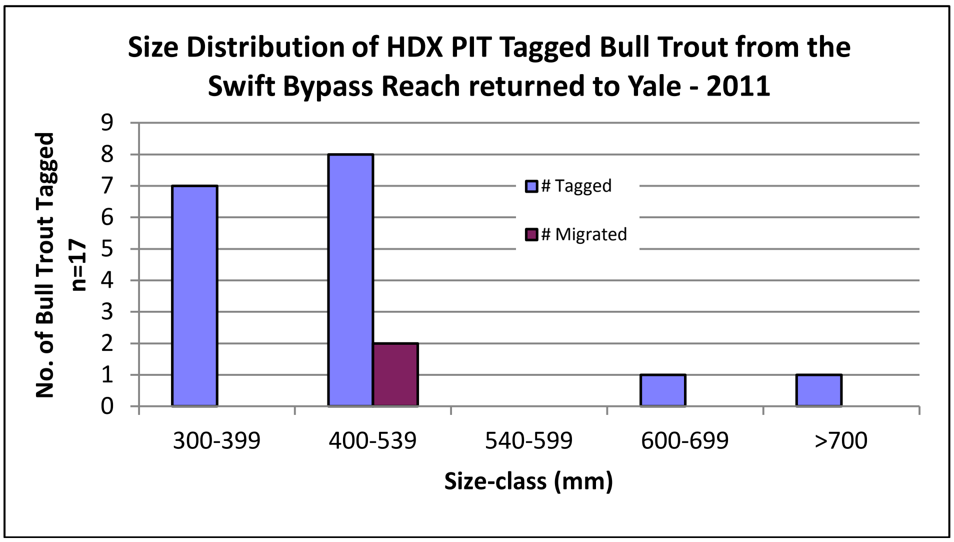

Figure 10. Size distribution of HDX PIT tagged bull trout from the Swift Bypass Reach returned to Yale in 2011.

Four of the six Swift Bypass Reach 2010 captures interrogated at the Cougar Creek antennas in 2011 were also interrogated moving up Cougar Creek during the 2010 spawn-time, thus are assumed repeat spawners. These bull trout averaged 642 mm when handled in the summer of 2010.

3.2.3 Evaluation of Swift and Yale Reservoir Bull Trout through the use of PIT tag Detections and Program MARK

The 2011 Swift and Yale Reservoir PIT tag detection data was also analyzed by statisticians from the environmental consulting firm Stillwater Sciences using the population structure software program MARK.

“Program MARK is a computer program that was used to estimate bull trout survival based on the available history of detections for each individual fish tagged and re-sighted during capture and detection efforts,” (White and Burnham 1999). All PIT tag and detection data was separated into two "capture periods” including:

- "Tagging periods" when fish were physically recovered (by a variety of methods) and (potentially) tagged, and
- "Antenna periods" when fish were detected at one of the stationary antenna, presumably on attempted spawning excursions.

There were a total of six capture periods for the Yale data (includes Yale Reservoir and Cougar Creek), and two for the Swift data (includes Swift Reservoir and Pine and Rush creeks) (Table 4). The objective of the analysis was to use Program MARK to estimate survival between capture periods, and probability of detection within each period.

Table 4. Capture periods 2008–2011.

Capture Period	Method	Yale	Swift
June–August 2008	Reservoir Sampling	X	
May–August 2009	Reservoir Sampling	X	
June–August 2010	Reservoir Sampling	X	
August–October 2010	Tributary Antennae Detects	X	
June–August 2011	Reservoir Sampling	X	X
August–October 2011	Tributary Antennae Detects	X	X

Because antennas have been operating in Swift for only one year, it was not possible to conduct an analysis of that data yet. However, the number of tagged fish in Swift Reservoir is adequate to conduct analysis when additional years of operating antennas are complete and data become available. It was possible to analyze the Yale data with Program MARK.

The probability of detection within a capture period is interpreted as the product of the probability that a fish will migrate past the antenna during that period and the probability that it will be detected at the antenna if it does. Since there are two antenna in Cougar Creek, and since a fish must pass both of them at least twice during migration, it was assumed that the detection probability for each capture period was close to 100%. Therefore the capture probabilities can also be interpreted as the estimate that a fish will attempt to spawn in a given year.

Several models were fitted to the Yale data using Program MARK, including: a "full model" with the maximum number of estimable parameters (9), and simplified models with fewer degrees of freedom. Of these, the most reasonable model (based on Akaiki Information Criterion, AIC) was the most parsimonious of those considered (Akaiki 1974). This model (the "Parsimonious model") assumes that the capture probabilities are the same for all tagging periods and the same for all antenna periods, and that the survival between sampling periods depends only on the type of sampling (that is, whether they were reservoir sampling periods or antenna detection periods).

The selected model has five degrees of freedom (Figure 11), including:

φ_{tt}: survival between reservoir sampling periods
φ_{ta}: survival from a reservoir sampling period to the following antenna detection period
φ_{at}: survival from a antenna detection period to the following reservoir sampling period
p_t: probability that a fish will be captured in a reservoir sampling period
p_a: probability that a tagged fish will be detected in an antenna detection period

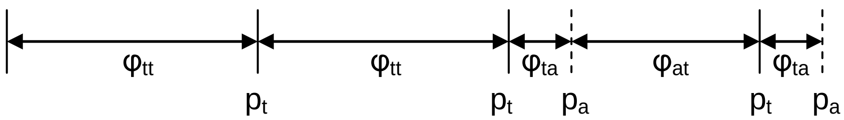

Figure 11. "Parsimonous model."

Despite a high level of uncertainty, there would appear to be about one chance in three or four that a given fish will make a spawning excursion in any given year, and a 50% to 60% chance that a fish will survive from one year to the next (Table 5). The confidence intervals on the model parameters are very wide, and when this is considered together with the simplifying assumptions (described above) made to reduce the degrees of freedom, these estimates should be used with great caution. These estimates should become more accurate and may change considerably as more years of data become available. In particular, it can be expected that the estimated survivals will rise, and the estimated capture probabilities will fall, as more data becomes available. Also as more data becomes available, models with more parameters (such as year-specific capture probabilities or survivals) may become more useful" (Technical Memo to Jeremiah Doyle from Stillwater Sciences, February 28, 2012).

Table 5. Summary of model results.

Parameter	Estimate	Standard Error	95% Confidence Interval	
			Lower 95%	Upper 95%
ϕ_{tt}	0.488	0.164	0.208	0.776
ϕ_{ta}	0.665	0.271	0.155	0.956
ϕ_{at}	0.88	0.419	0.003	1
p_t	0.233	0.092	0.1	0.455
p_a	0.286	0.126	0.107	0.572

3.3 Lewis River Bull Trout Collection and Transport Activities

3.3.1 FERC Project License Article 402(a) and Lewis River Settlement Agreement Sections 4.9.1 & 4.9.2 - Yale Tailrace Collection and Transportation

Per Article 402(a) in the FERC licenses and the Lewis River SA section 4.9.1, PacifiCorp annually captures and transports bull trout from the Yale powerhouse tailrace (upper Merwin Reservoir) to the mouth of Cougar Creek, a Yale Reservoir tributary. A total of 141 bull trout have been captured from the Yale tailrace since the program began in 1995.

To capture bull trout from the Yale tailwaters, monofilament mesh tangle nets are used (typically 40 m long, 2 m deep, and consisting of 6.5 cm stretch mesh). Netting occurs on a weekly basis beginning in June and ending mid-August. Netting usually occurs between the hours of 0900 and 1200. During this time, the powerhouse generators are taken off-line to facilitate deployment and handling of the nets. Nets are tied to the powerhouse wall and then stretched across the tailrace area using a powerboat. The nets are then allowed to sink to the bottom. Depending on conditions or capture rate, the nets are either held by hand on one end or allowed to fish unattended. The maximum time nets are allowed to fish is ten minutes.

Upon capture of a bull trout, it is immediately freed of the net (usually by cutting the net material) and placed in a live well. Captured fish are measured to their caudal fork, weighed with a hand-held scale to the nearest gram, and inserted with a uniquely coded half-duplex PIT tag. Along with fork length information, the weights of captured bull trout will be used to assess the condition factor (K-factor) of fish residing in Lake Merwin.

Use of Alternative Capture Methods
PacifiCorp continues consider more effective and less intrusive methods to collect bull trout from the Yale tailrace. Past alternative methods investigated include; beach seines, purse seines, drifting tangle nets when the powerhouse is online, and angling.

In 2011, tangle nets and angling were the only methods used and, to date, remain the most effective. PacifiCorp continues research on possible alternative methods of effective capture and transport. However, upon investigation of each concept or pilot test conducted at other Northwestern dams, PacifiCorp has not been successful in finding a better alternative than the current method.

Yale Netting Results
At the Yale powerhouse tailrace, six capture attempts were completed from June 9 through August 9, 2011 yielding a total of six bull trout. Methods and effort remained relatively the same in 2011 as compared to 2010 with two fewer sampling events conducted in 2011 due to

constraints from the USFWS Abernathy Conservation Genetics Lab (Abernathy Lab) Space to run Lewis River genetic samples was not available after August 10th.

The large abundance of staging adult kokanee (*Oncorhynchus nerka*) encountered throughout the sampling period in 2010 was not observed in 2011. As in past years (with the exception of 2010) kokanee do not show up in great numbers in the Yale tailrace until August, and this held true during 2011 sampling.

Other species besides bull trout and kokanee captured, in order of frequency, included largescale suckers (*Catostomus macrocheilus*), northern pikeminnow (*Ptychocheilus oregonensis*), mountain whitefish (*Prosopium williamsonii)*, coho salmon (*O. kisutch)*, coastal cutthroat trout (*O. clarkii*), and rainbow trout (*O. mykiss*) all of which were returned to the tailrace. Information from each bull trout capture is shown in Table 6.

Of the 141 bull trout captured from the Yale tailrace since 1995, 109 have been transported to the mouth of Cougar Creek (Table 7). In past collection activities, bull trout placed into hatchery trucks were simply transported to Cougar Creek and released. New in 2011 with the completion of the Lewis River bull trout genetic baseline, all new Yale tailrace bull trout captures were transported to Speelyai Hatchery and held while genetic analysis of each individual fish was performed at the Abernathy Lab. During the 2011 field season planning process, it was agreed that bull trout found to be genetically endemic to either Rush or Pine Creek at a greatest likelihood of origin score of $\geq$.99 would be transported upstream to Swift Reservoir and released at the Swift Forest Campground boat launch. In contrast, bull trout with a likelihood score of less than 0.99 to Rush or Pine Creeks would be released at the mouth of Cougar Creek in Yale Reservoir.

All live bull trout captures were transported to Speelyai Hatchery and held in troughs while awaiting genetic assignment. Troughs were watered up with continually circulating fresh-water. Trough size was approximately seven meters (m) long by one meter wide with a water depth of 0.75 m and when bull trout were being held, were covered completely with two centimeter thick plywood affixed with clamps to prohibit bull trout from jumping out of the tanks. The longest a bull trout was held while awaiting genetic assignment was 72 hours. Average holding time held was less than 48 hours. Water temperature of holding tanks was less than 10° C during the entire sampling period (June 9 – August 9, 2011). Only like-sized bull trout were held in the same tanks, fish less than 250 millimeters were held in a separate trough from larger fish. No injuries and no direct mortality were observed of any hatchery held bull trout during 2011 activities. For a description of Materials and Methods used by the Abernathy Lab for genetic analysis of Lewis River bull trout in 2011 please refer to the report titled “Rapid Response Genetic Analysis of Bull Trout Collected in the Lewis River, WA. 2011 Annual Report” (DeHaan and Adams 2011).

Table 6. Biological, tag, genetic, and transportation information of captured bull trout netted in the Yale Tailrace – 2011

Date	PIT #	Fork Length (mm)	Weight (g)	Likelihood of Origin Score (Genotype)	Comments
6/9/2011	AOF6552	630	3500	88%-Pine Creek 12%-Cougar Creek	Transported to Yale Reservoir per the direction of USFWS
6/9/2011	AOF6553	611	3260	99.9%-Cougar Creek	Transported to Yale Reservoir per the direction of USFWS
6/21/2011	AOF656A	624	3200	99.9%-Cougar Creek	Transported to Yale Reservoir per the direction of USFWS
6/21/2011	n/a	480	980	n/a	Capture mortality
6/28/2011	AOF6579	480	1440	100%-Cougar Creek	Transported to Yale Reservoir per the direction of USFWS
7/12/2011	A89AF65	340	480	100%-Cougar Creek	Transported to Yale Reservoir per the direction of USFWS
7/26/2011	n/a	n/a	n/a	n/a	No bull trout captured
8/9/2011	n/a	n/a	n/a	n/a	No bull trout captured

Of the six Yale tailrace bull trout captures in 2011, five were transported upstream and released into Yale Reservoir per their genetic assignments while the remaining one was a capture mortality (Table 6). Of the five bull trout transported to Yale Reservoir, all were detected moving upstream past the stream-width PIT tag detector located near the mouth of Cougar Creek after release, with only four of the five migrating upstream during historical Cougar Creek bull trout spawn time (September 15 – October 30).

Table 7. Number of bull trout collected from Yale tailrace (Merwin Reservoir) and transferred to the mouth of Cougar Creek (Yale tributary): 1995 – 2011.

YEAR	No. captured at the Yale tailrace	No. transferred to mouth of Cougar Creek	No. released back into Merwin reservoir.	MORTALITIES
1995	15	9	6	0
1996	15	13	2	0
1997	10	10	0	0
1998	6	6	0	0
1999	6	0	6	0
2000	7	7	0	0
2001	0	0	0	0
2002	6	5	1	0
2003	19	8	1	10^
2004	8	3	5	0
2005	5	5	0	0
2006	5	5	0	0
2007	13	13	0	0
2008	15	15	0	0
2009	5	5	0	0
2010	1	0	0	1
2011	6	5	0	1
TOTAL	**141**	**109**	**21**	**12**

^Please refer to the 2003 PacifiCorp Threatened and Endangered Species Monitoring Report for a description of mortalities

Table 8. Contribution of Merwin bull trout transported to Cougar Creek: 1995-2011

YEAR	Bull trout escapement into Cougar Creek^	Number of bull trout released	Number of bull trout observed with Yale tailrace tags *									Proportion Estimate of Merwin bull trout transported to Yale that ascend Cougar Creek**
			Chart.	Orange	White	Yellow	Blue	Pink	Y/G bi-color	Green	PIT*** Antenna	
1995	7	9				2						22%
1996	11	13				1						8%
1997	14	10				2		1				30%
1998	7	6				2				2		66%
1999	9	0										n/a
2000	9	7						1				14%
2001	9	0										n/a
2002	15	5				1						20%
2003	21	8					1					13%
	18	3			1							33%
2005	31	5		1	1							40%
2006	26	5								1		20%
2007	38	13	1									7%
2008	60	15	1						1	1		20%
2009	50	5				1						20%
2010	42	0										n/a
2011	52	5									5	100%

NOTES:

* Orange = 2005; White= 2004; Blue = 2003, Yellow = 1995, 1996, 1998, 2002, 2009; Pink =1997, 2000; Green = 1997,2006; Chartreuse = 2007; Yellow/Green bi-color = 2008

** Estimate is based only on year of release and only on tags observed. As a result, the estimate is considered the lowest percent contribution possible.

***Contribution of Merwin bull trout to Cougar Creek spawning population evaluated by uniquely coded PIT tag interrogations at the stream-width PIT tag detector in Cougar Creek.

^ 1995-2006 bull trout escapement estimates represent peak counts plus any mortalities or tagged fish observed that are not represented in the peak count. 2007-present bull trout escapement estimates represent redd counts with expansion factors of 2 fish per redd observed.

3.3.2 FERC Project License Article 402(a) and Lewis River Settlement Agreement Sections 4.9.1 & 4.9.2 - Bull Trout Capture and Transport Activities in the Swift Bypass Reach

The Swift Bypass Reach is the former Lewis River channel between the Swift No. 1 and Swift No. 2 hydroelectric projects. Since 2010, a minimum flow of 65 cubic feet per second (cfs) has flowed in the Bypass Reach through what the SA termed the "Upper Release Point" and the "Canal Drain". The Upper Release Point flows from the Swift No. 2 Power Canal directly upstream from the Swift No. 1 spill plunge pool and provides 51 – 76 cfs of water depending on the time of year. The Canal Drain flows from the Swift No. 2 Power Canal into an approximately 350 m long reach (termed the Constructed Channel) that is relatively unaffected by Swift No. 1 spill events and provides a continual 14 cfs of water flow. This Constructed Channel then joins the main channel Bypass Reach. Along with Ole Creek, these two water release points provide most of the flow into the Bypass Reach.

In 1999, The Utilities began netting the Swift No. 2 powerhouse tailrace as part of requirements contained in amendments to Article 51 of the former Merwin license. The tailrace was not netted from 2001 to 2005 because of the Swift No. 2 canal failure in 2001 and subsequent reconstruction. Capture efforts were then restarted in 2006 pursuant to sections 4.9.1 and 4.9.2 of the Lewis River Settlement Agreement and in 2008 pursuant to Article 402(a) of the new FERC licenses for Swift No. 1 and No. 2.

At the 2007 annual bull trout coordination meeting (attended by USFWS, WDFW, and PacifiCorp), the Utilities proposed to discontinue netting the Swift No. 2 tailrace (since only two fish had been captured since 1999) and move the collection site to an area near the International Paper (IP) Bridge within the Swift Bypass Reach (Figure 12). As noticed in past Swift Bypass Reach snorkel surveys, this area was found to contain adult bull trout between the months of June through October. The USFWS and those in attendance at the 2007 coordination meeting approved this recommendation (see Utilities' 2007 Annual Bull Trout Monitoring Plan for meeting notes http://www.pacificorp.com/content/dam/pacificorp/doc/Energy_Sources/Hydro/Hydro_Licensing/Lewis_River/Annual_Bull_Trout_Monitoring_Plan_2007.pdf).

Figure 12. Map showing bull trout sampling areas between Swift No.1 and Swift No. 2 powerhouses.

2011 collection activities typically focused on capturing bull trout from the agreed-upon sampling area of the bypass reach below the International Paper Bridge and from the confluence of the bypass reach with Yale Reservoir (Figure 12). Angling was the primary method of capture in this area early in the season (when bull trout are aggressive and still actively feeding) due to its effectiveness and low rate of incidental catch of other species present in the survey area.

As the season progressed and bull trout become increasingly indifferent to feeding, the method of capture switched to utilizing passively set tangle nets. Nets similar in length, depth and mesh size to those used at Eagle Cliffs and the Yale powerhouse tailrace were used for the Swift Bypass efforts. Unlike other collection areas within the Lewis River basin where nets are allowed to passively "soak" unattended, bull trout captured in the bypass reach are corralled by biologists in snorkel gear into set nets and so, are constantly checked. When a bull trout became entangled, the net was immediately pulled in and the bull trout freed and placed in a holding container (aerated cooler or live box in the stream).

The Swift Bypass Reach was sampled seven times from June 8 to August 8, 2011. During this sampling time-frame, 32 total bull trout were captured. Of these, 27 were newly captured and five were past year recaptures (Appendix B). Four of the 32 bull trout captures were collected by angling while the remaining 28 were captured with tangle nets. After capture, bull trout were tagged with a uniquely coded half-duplex PIT tag, sampled for genetic tissue, weighed, and measured to their caudal fork.

In past collection activities, Swift Bypass Reach captured bull trout, after tagging and biologically sampling, were simply released back to the point of capture. New in 2011 with the completion of the Lewis River bull trout genetic baseline, all new bypass reach bull trout captures were transported to Speelyai Hatchery and held while rapid response genetic analysis of each individual fish was performed at the Abernathy Lab. The intent of the rapid response genetic analysis was to identify any Swift origin bull trout residing in Yale Reservoir that are cut-off from returning to their natal stream to spawn and transport them back upstream into Swift Reservoir. It is commonly accepted that bull trout are highly migratory and, over time, a portion of the Swift bull trout population has migrated downstream of Swift No. 1 dam either by passing through during spill events or passing through the turbine units in the powerhouse.

Currently, the number of samples comprising the Lewis River bull trout genetic baseline used for genetic assignment is low. Further juvenile bull trout collection from the three local populations will increase the confidence in the data-set. Until additional samples are added, it was decided during 2011 planning meetings to err on the side of caution when deciding which captured bull trout would be transported upstream for release into Swift Reservoir. Therefore, only bull trout found to be genetically endemic to Rush Creek, Pine Creek, or a combination of the two at a Greatest Likelihood of Origin score of ≥.99 were transported upstream to Swift Reservoir in 2011. In contrast, bull trout with a likelihood score of less than 0.99 to Rush Creek, Pine Creek, a combination of the two, or with a Greatest Likelihood of Origin score greater than 0.02 to Cougar Creek was released back into Yale Reservoir. A sheet detailing genetic analysis of all previously captured bull trout that were simply sampled and released during prior years was on-site so as to determine real-time origin of any recaptured fish. If origin of recaptured fish was known, that fish was not held at Speelyai Hatchery, but instead taken to one of the release points described above as determined by its greatest likelihood of origin score. For a description of Materials and Methods used by the lab for genetic analysis of Lewis River bull trout in 2011 please refer to the report titled “Rapid Response Genetic Analysis of Bull Trout Collected in the Lewis River, WA. 2011 Annual Report” (DeHaan and Adams 2011) located in Appendix C of this Report. For a description of holding methods at Speelyai Hatchery for Swift Bypass Reach captured bull trout, please refer to section 3.3.1 of this Report.

Of the 32 bull trout captured in the Swift Bypass Reach in 2011, 15 were found to be of Pine or Rush Creek origin and transported upstream for release into Swift Reservoir. The remaining 17 captures either did not score high enough to Rush or Pine or scored a high likelihood to the Cougar Creek population and as such, were returned to Yale Reservoir (Appendix B).

Figure 13 illustrates the size distribution of 2011 Swift Bypass Reach captures by area of final disposition. Interesting to note is the size discrepancy between bull trout in the bypass reach genetically assigned to the Cougar Creek local population as opposed to those assigned to either the Rush or Pine Creek local populations.

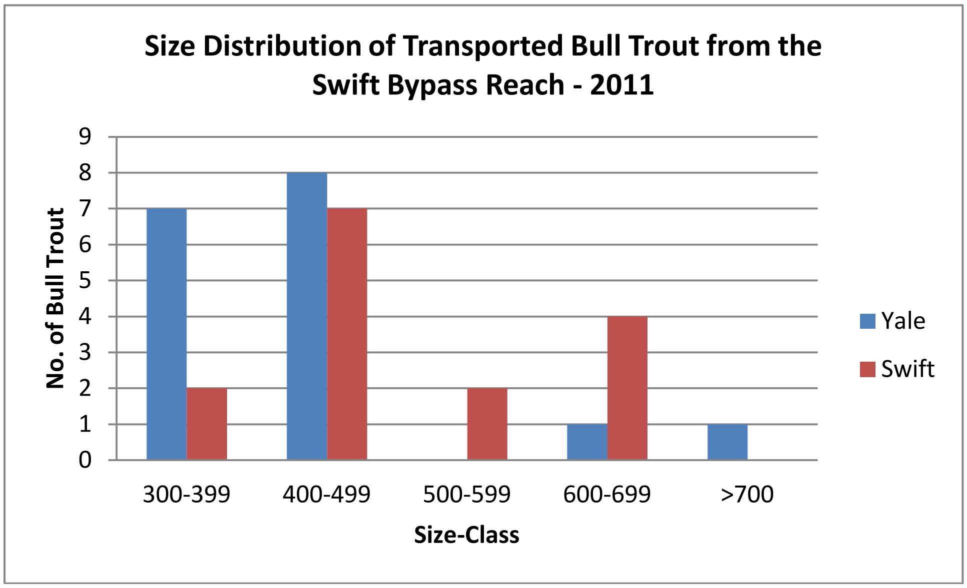

Figure 13. **Size distribution of transported bull trout from the Swift Bypass Reach in 2011.**

Table 9. **Contribution of Swift Bypass Reach tagged bull trout to the Cougar Creek spawning escapement is assessed**

Year	Bull trout escapement into Cougar Creek^	Number of bull trout tagged in the bypass & released into Yale (in-year tags only)	Number of bull trout observed with Swift Bypass Reach tags during surveys*				Proportion Estimate (2007-2009) of In-year Swift Bypass Reach tagged bull trout that ascend Cougar Creek**
			Pink	Blue/Orange bi-color	Red	PIT Antenna Detections	
2007	38	14	4				28%
2008	60	6	1	1			16%
2009	50	24	1	1	4		16%
2010	42	25				12	48%
2011	52	17				2	12%

Pink = 2007; Blue/Orange bi-color = 2008; Red = 2009
* 2007-2009 Estimate is based only on peak count of tags observed. As a result, the estimate is considered the lowest percent contribution possible.
**2010-2011 Proportion is not an estimate and is based on detections at the Cougar Creek PIT tag antennas.
^Bull trout escapement estimates represent redd count expansion numbers of 2 fish per redd observed

3.3.3 Bull Trout Collection and Transport from within the Swift Power Canal

The Swift Power Canal is an approximately 4800m long, 60m wide, and 5-8m deep open air water conveyance system connecting the Swift No. 1 powerhouse to the Swift No. 2 powerhouse (Figure 12). About 3200m of the canal is earthen bottom while the remaining 1600m is lined with concrete. The only entry for fish into the canal is from turbine passage at the Swift No. 1 powerhouse at the upstream end and the only exit from the canal is at the downstream end through one of two spillways (check structure and surge arresting structure), through one of two small pipes (water supply for the Upper Release Point and Constructed Channel) or through the turbines at Swift No. 2 powerhouse.

It is unknown exactly how many fish become entrained and what the survival rate of turbine passage is at Swift No. 1 on an annual basis. It is assumed the larger the fish, the greater the turbine passage mortality rate; from the high head at Swift No. 1 dam (greater than 500 feet at full pool) and from the Francis type runners employed in the Swift No. 1 powerhouse. Past scientific studies that quantified turbine passage mortality in Francis type runners revealed high variation, with estimated turbine mortality ranging from 5 to 90%. These results are based primarily on the size of fish and the velocity (head) at which they travel through the turbine blades (Bell 1990, Larineir and Travade 2002).

Due to the Swift No. 1 deep water intakes (44m) at the upstream end, water temperatures within the canal stay relatively cool throughout the summer and early fall (14° C or less). Habitat within the canal with concern to bull trout is suitable for rearing and excellent for foraging due to the high diversity and relative abundance of other aquatic species observed during previous bull trout collection activities as well as the high condition factor scores recorded from previously captured bull trout from within the canal.

No empirical data exists concerning the availability of bull trout spawning habitat within the canal, though based on maximum water temperatures recorded during bull trout spawn times, it is assumed none exists; because migration out of the canal is problematic, bull trout entrained within the canal are, in essence, genetically lost to the population as a whole. In an effort to restore connectivity of entrained individuals to the greater population, bull trout collection and transport activities were performed within the Swift Power Canal on four separate occasions in the months of March, July, and August 2011.

Similar to Yale tailrace bull trout collection and transport activities, monofilament tangle nets were employed to try and capture any bull trout residing within the Swift Power Canal. Crews deployed nets from a power boat and allowed the nets to soak unattended for up to ten minutes. Mesh size of the nets ranged from 1 cm to 6 cm in order to try and capture a greater range of size-classes. When appropriate and when time permitted, researchers also fished for entrained bull trout using rod and reel (Section 3.3.3-1).

Netting mainly took place at the upstream end of the power canal near the discharge from the Swift No. 1 powerhouse, though some nets were also deployed downstream in the concrete lined portion of the canal. Netting typically occurred between the hours of 09:00 and 13:00 and due to safety concerns, Swift No. 1 and No. 2 powerhouses were taken off-line and not in operation. Like Yale powerhouse tailrace collection activities, a fish transport tank was on-site during all netting days to transport any captured bull trout upstream to Swift Reservoir. At this time, per the direction of the USFWS, all Swift Power Canal captured bull trout are transported upstream to Swift Reservoir.

Five bull trout were captured during the 2011 Swift Power Canal collection and transport activities. Bull trout were encountered during three of the four surveys; four were captured with tangle nets and one was captured by rod and reel. Tag and biological information concerning transported bull trout can be found in Table 10.

None of the five Swift Power Canal transported bull trout in 2011 were later detected at either the Pine or Rush Creek stream-width PIT tag antennas.

All captured non-target species were quantified and then returned to the power canal. Encountered species during the four power canal netting days, in order of abundance, were 37 rainbow trout, seven mountain whitefish, two large-scale suckers, one coastal cutthroat, one brook trout, and one spring Chinook.

Table 10. Tag and biological information for bull trout captured and transported from within the Swift Power Canal – 2011.

Date	FL(mm)	Genetic vial	Weight (grams)	HDX PIT Tag
7/27/2011	367	2030-058	580	A89AF47
7/27/2011	379	2030-057	680	A89AF46
7/29/2011	542	2030-055	2200	A89AF44
7/29/2011	525	2030-054	1800	A89AF43
8/2/2011	410	n/a	1010	A89AF3F

3.4 Lewis River Bull Trout Spawning Surveys

3.4.1 FERC Project License Article 402(b) and Lewis River Settlement Agreement section 9.6 - Cougar Creek Spawning Estimate

Since 1979, PacifiCorp biologists, along with various state and federal agencies, have conducted annual surveys to estimate spawning escapement of kokanee in Cougar Creek. Along with the kokanee, surveyors also count the number of bull trout and bull trout redds observed within the creek. In 2011, the Utilities conducted six Cougar Creek bull trout redd surveys.

Based on the presence and detection of multiple bull trout redds in Cougar Creek since 2006, redd counts have become the main source for the annual Cougar Creek bull trout spawner abundance estimate. Bull trout redd surveys were conducted in Cougar Creek weekly from September 19, 2011 to October 24, 2011.

Surveys begin at the mouth of the creek and end at the creek's spring source, a distance of approximately 2100 m. Though redd count methodology has effectively replaced live peak counts as the metric used to estimate spawner abundance, peak counts are still performed during redd surveys in order to continue this established trend for comparison and calibration of the redd count expansion method.

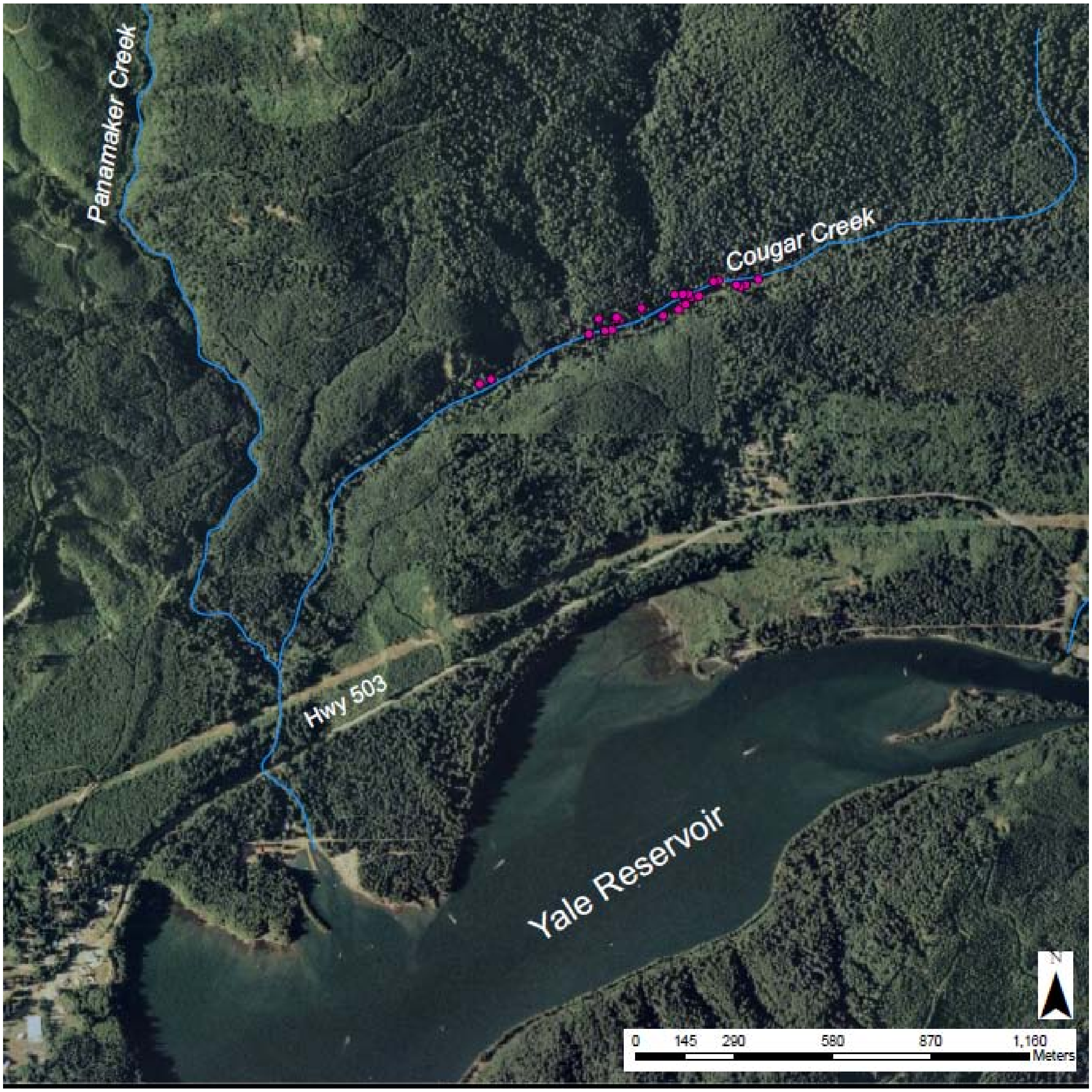

Figure 14. GPS locations of bull trout redds in Cougar Creek in 2011. Each pink dot represents an individual bull trout redd (n=26).

Due to the wide range use of redd counts to quantify bull trout spawner abundance, multiple research studies have been performed in an effort to gauge the precision of this methodology and also to question the efficacy of redd counts as a population estimator (Dunham et al. 2001, Muhlfeld et al. 2006). Most often, redd surveys are conducted in large river systems with multiple different observers. The large systems necessitate the need for index areas mainly due to time and logistical constraints. The use of indices has been questioned based on their reliance of fish coming back to the same area at the same time every year to spawn. In addition, the use of multiple observer teams and a variety of observers on the same project, is considered to cause inaccuracies based on the variability between observers' experience with identifying redds.

The redd count methodology employed within Cougar Creek differs from most large-scale redd surveys in that the stream is small enough to feasibly survey the entire length and currently is the only known bull trout spawning stream in Yale Reservoir. Cougar Creek also lends itself nicely to these types of surveys in that the water is extremely clear and has stable flow for most of the survey period. Also, redd life, the amount of time a redd remains visible, has an exceptionally long duration. Most, if not all, observed redds remain visible during the entire time-frame of the surveys.

In 2011, two biologists walked the entire 2100 m of Cougar Creek during each redd survey. Weekly surveys were completed over an extended period of time to address potential error associated with spawn-timing. Surveys were conducted until no fish or no new redds were observed. To alleviate inter-observer variability, surveys were performed by the same experienced biologists every week. Dunham et al. (2001) specified that a sampling effort should not rely on indices and should use the same surveyors, as an effective way of improving the reliability of bull trout redd counts.

The real challenge of using bull trout redds to quantify the bull trout spawning population size lies in determining the relationship between redd counts and actual numbers of fish (Budy et al. 2003). Much past and present research has been conducted that attempts to correlate the number of spawning adult bull trout per redd.

Baxter and Westover (2000) used a weir on a fluvial and adfluvial population of bull trout on the Wigwam River in Canada and estimated their ratio to be 1.2 fish to 1 redd, while Sankovich et al. (2003) using a weir, estimated a ratio of 2.1 to 1 for a fluvial and resident bull trout population on the Walla Walla River. Ratliff et al. (1996) using a weir and subsequent redd counts on an adfluvial bull trout population, found the ratio on the Metolius River to be 2.3 fish to 1 redd, while Taylor and Reasoner (2000) using a weir with a fish counter on an adfluvial population of bull trout in the McKenzie River had estimates of 3.5 and 4.3 fish for each redd. It seems that the number of bull trout per redd is most likely basin or watershed specific and can be highly variable.

At this time, given that the exact number of bull trout that ascended Cougar Creek to spawn is unknown, there is no reliable way to get an approximate number of fish per redd. A weir was attempted in Cougar Creek in 1996 but subsequently failed. Starting in 2007 and continuing through 2010, an underwater video camera was installed to visually count adult bull trout as they migrated upstream and downstream in an effort to obtain an accurate number of fish per redd.

Fish counts from the underwater video camera were processed, but unfortunately, based on bull trout migration information obtained from the PIT antennas near the mouth of Cougar Creek, it is uncertain if the underwater video will be an effective way at capturing true spawning bull trout numbers. Data from the PIT antennas identified that the majority of migrating PIT tagged bull trout move upstream and downstream Cougar Creek multiple times during the spawn time-frame prior to spawning.

Footage from the underwater video camera only allows biologists to count the number of bull trout that volitionally swim past the camera lens, it cannot distinguish individual bull trout (i.e. from external marks or size). Therefore, an individual bull trout that migrates upstream past the camera and then subsequently migrates back downstream past the same camera multiple times during the spawning season would be counted by the video reviewer multiple times, as different fish, positively skewing total migration numbers.

Therefore, until we are able to find a method to obtain true numbers of adult bull trout spawners that enter Cougar Creek. PacifiCorp has elected to use two fish per redd as the interim index ratio.

During each 2011 redd survey, new redds were flagged and identified by Global Positioning Satellite (GPS) coordinates. The date, location of redd in relation to the flag, and GPS coordinates were all written on the flagging (Figure 14). Subsequent surveys inspected each redd to see if they were still visible. If a redd was still visible, that information was written on the flagging with the date, until the redd was no longer visible, at which time this was noted on the flagging. Biologists also counted any bull trout observed within the vicinity of each redd. Throughout the spawning season, new redds were flagged and identified as described above until bull trout adults and new redds were no longer observed in Cougar Creek.

26 individual bull trout redds were observed in Cougar Creek in 2011. Using the two fish per redd expansion, 52 spawning bull trout were estimated to have ascended Cougar Creek in 2011 (Figure 15). The first recorded redd was observed on September 19, 2011, and the last new redd was observed on October 24, 2011. The bulk of redd construction occurred during the two week span between September 19th and October 3rd when 23 new bull trout redds were counted. A peak count of nine new redds occurred during the October 3rd survey.

The bulk of bull trout redds were observed in the upper half of the creek upstream of a log jam that on most years is impassable to kokanee (Figure 14).

A recent concern in Cougar Creek, first observed in 2008, are bull trout redds found to be superimposed over one another. During redd counts in 2011, one bull trout redd was observed superimposed over a previously excavated bull trout redd. The superimposed redds were in an area where redd superimposition previously observed in 2008-2010.

Flagging from redd surveys performed in 2010 were left in place over the course of the year and along with GPS coordinates, care was taken to document redd habitat areas used consecutively from the previous year. It was observed in 2011 that 17 of the 26 redds (65%) were constructed very near and often in nearly the exact spots as the previous year(s). Prior observations as these prompted surveyors in 2008 and 2010 to collect data documenting the habitat parameters for redd construction by bull trout in Cougar Creek, this data collection was again replicated in 2011.

During the course of redd surveys, biologists documented the water depth over the redd egg pocket, length and width of redd pocket and pit, location of redd in relation to the stream, location of the redd in relation to any large wood, and the size of gravel present in the redd. This information will continue to be collected to standardize bull trout redd habitat attributes in Cougar and other creeks. Standardized bull trout redd habitat data may be used in the future to evaluate redd superimposition that could occur between bull trout and reintroduced anadromous fish species when both occupy and spawn in the same stream.

Along with redd counts, a peak visual count of bull trout was also performed in the same manner that began in 1979 (Figure 16). This count is not considered a spawning population estimate as it relies on a peak count of bull trout observed on a single sampling event. Rather, the annual peak counts are used to monitor Cougar Creek bull trout relative abundance trends from year to year. In 2011 the peak visual count was 32 adult bull trout. The peak count of 32 bull trout is considered to be the minimum number of bull trout that ascended Cougar Creek in 2011.

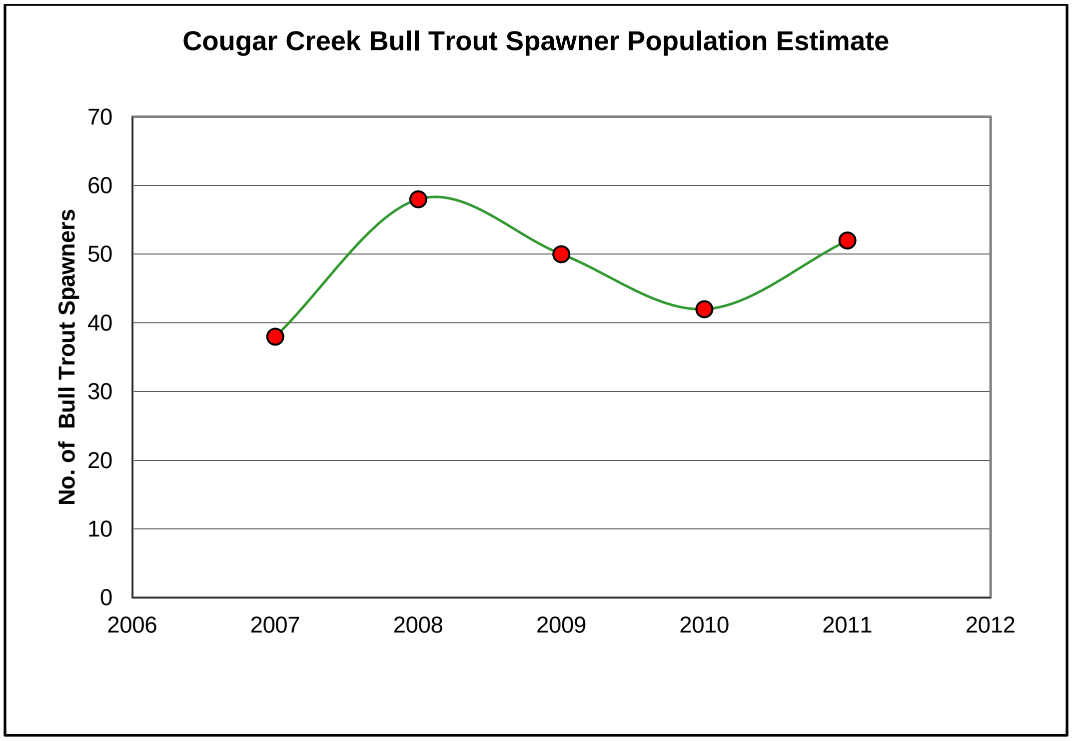

Figure 15. Annual Cougar Creek bull trout spawning escapement based on redd surveys, 2007-2011.

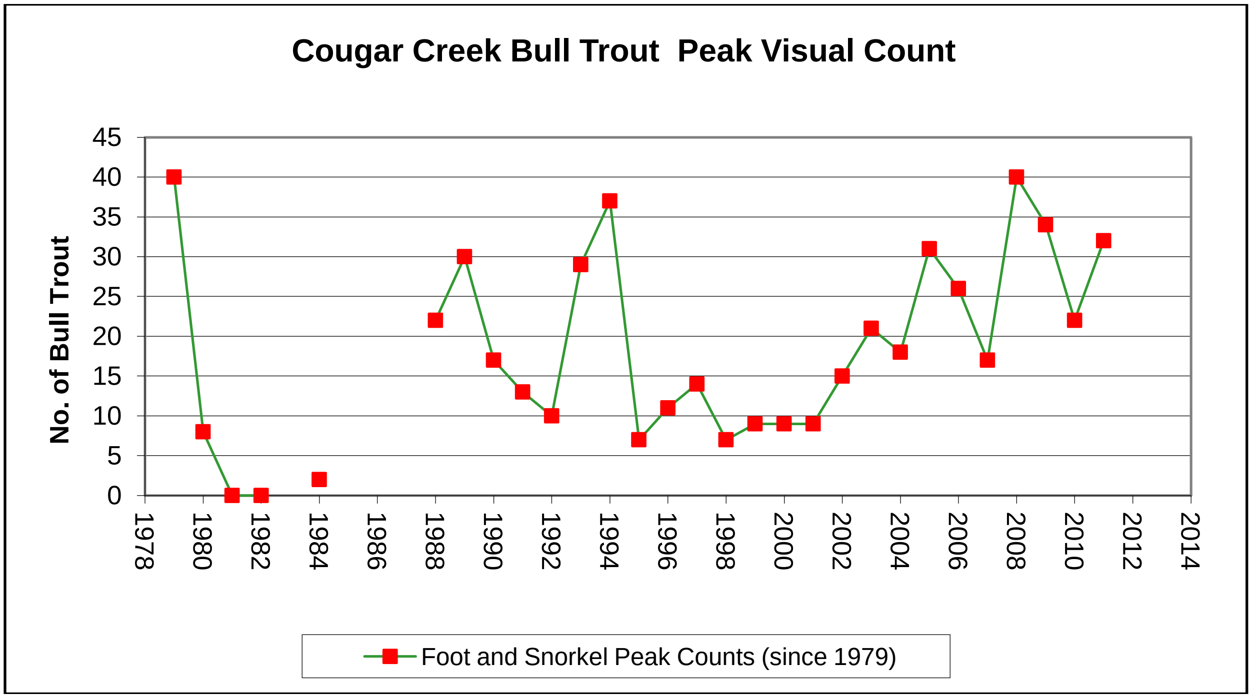

Figure 16. Cougar Creek peak count based on foot and snorkel surveys, 1979-2011.

3.4.2 Bull Trout Redd Surveys of Pine Creek Tributary P8

P8 (Figure 17) is the eighth and largest tributary to Pine Creek when tributaries are counted from the mouth of Pine Creek upstream. Based on surveys performed in 1999 and 2000 to document the extent of available anadromous fish habitat within the North Fork Lewis River basin, P8 contained approximately 6400 m of accessible anadromous fish habitat and had relatively low gradient for the first 1600 m. P8 is a relatively small stream, with an average wetted width of 3.5 m, but it contains abundant annual flow and cold water (PacifiCorp and Cowlitz PUD 2004).

Redd surveys (consistent with methodology used for Cougar Creek) were performed on Pine Creek tributary P8 four times (September 20th – October 14th) during the 2011 bull trout spawning season. The first recorded redd was observed on September 20th and the last observed redd was recorded on October 14th. A peak count of eleven new redds occurred during the survey on September 27th. In all, GPS coordinates were collected from 26 bull trout redds which were observed and counted from the mouth of P8 to 2100 m upstream (Figure 18). Based on expansion factors of two adult bull trout per redd, 52 bull trout were estimated to have spawned within P8 (Figure 19).

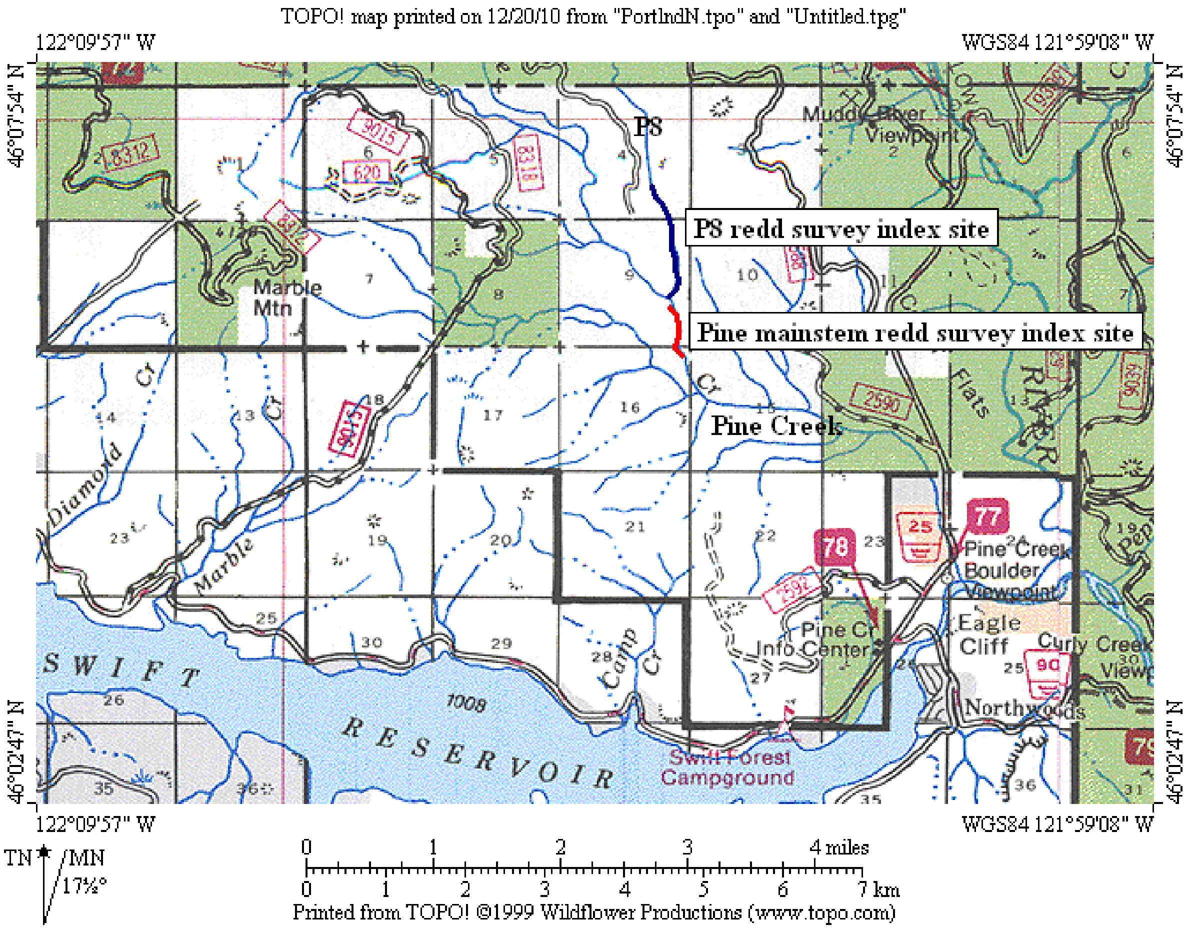

Figure 17. Map of Pine Creek and tributary P8 redd survey index sites.

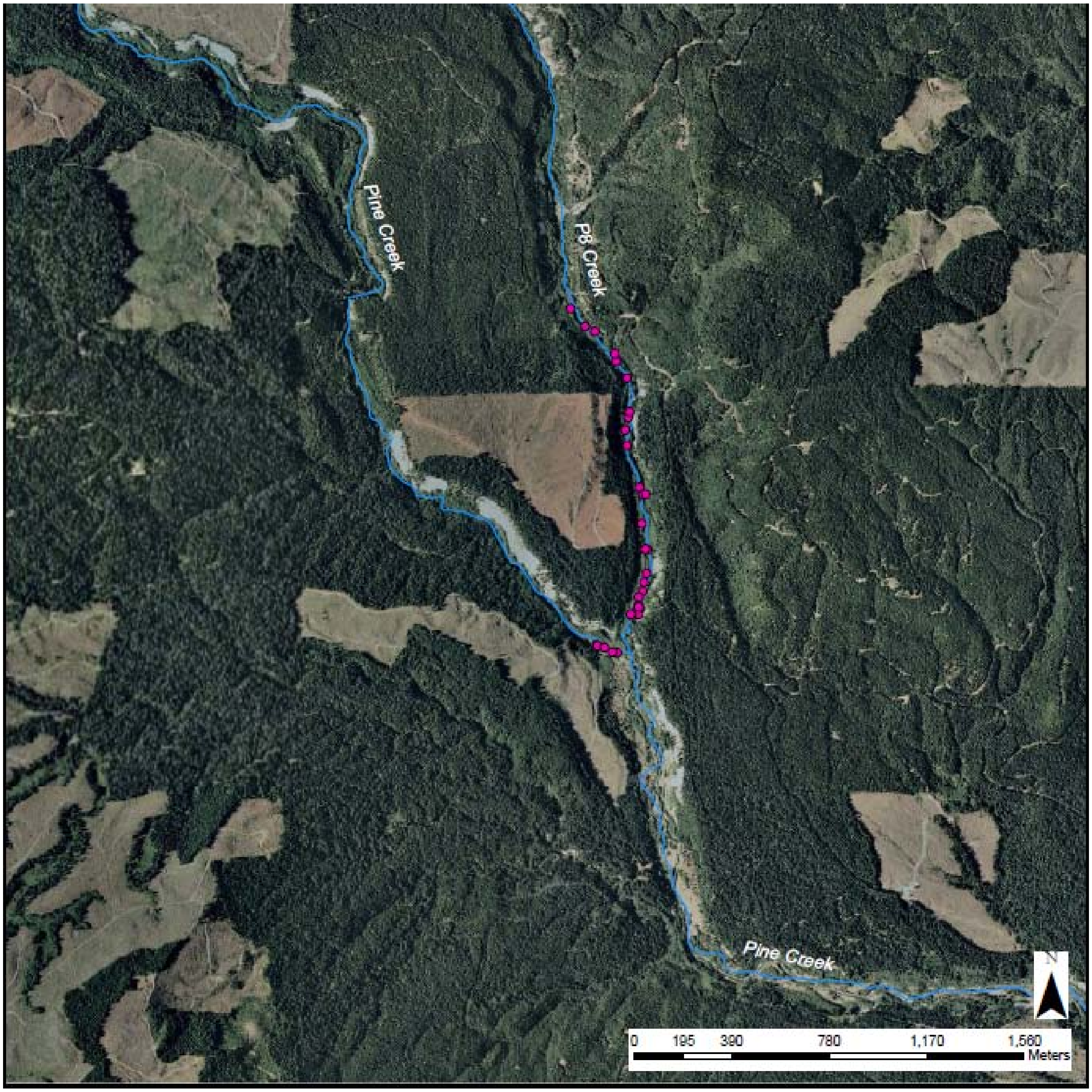

Figure 18. GPS locations of bull trout redds in Pine and P8 creeks in 2011. Each pink dot represents an individual bull trout redd (n=31).

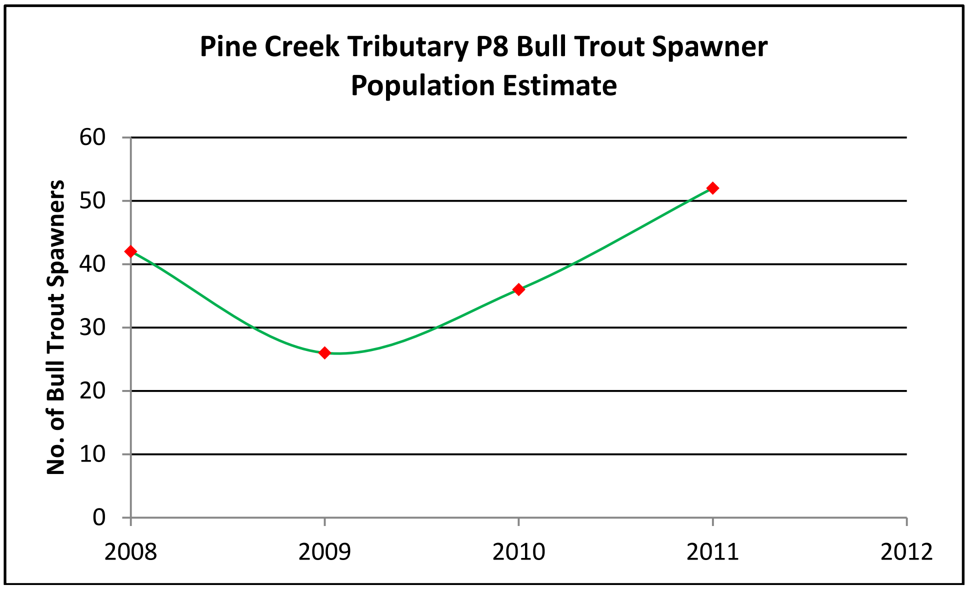

Figure 19. Pine Creek tributary P8 bull trout spawning population estimate based on redd expansion estimate of two fish per redd (2008 and 2009 data courtesy of WDFW).

3.4.3 Bull Trout Redd Surveys of Pine Creek Mainstem

Based on the observations of multiple redds during a late season (October) Pine Creek mainstem bull trout snorkel in 2009, and to add to the bull trout redd data collected in 2010 from the Pine Creek mainstem, a Pine Creek mainstem index area was once again surveyed for bull trout redds in 2011.

The over-arching goal of the Pine Creek mainstem bull trout redd surveys, was to test the efficacy of performing these surveys within Pine Creek in the future. Biologists were concerned that it would prove extremely difficult to locate and identify redds in the mainstem, and if redds were indeed indentified, how long those redds would persist in a high energy stream such as Pine Creek.

At this time, the intention of these surveys is not to identify spatial or temporal distribution or to extrapolate a total number of spawners (as is typical of other redd count surveys) but to assess redd longevity or "redd life" once redds are identified. If redd data is to be used to assess spatial and temporal distribution as well as abundance in the future, redd life needs to be established in order to determine the frequency of surveys so as not to miss redds between survey dates.

Bull trout redd surveys were performed in 2011 of the approximately 400m long index site within Pine Creek that was established in 2010. This index area lies at, and directly below the confluence with tributary P8. Surveys were performed every seven days from September 27 through October 14, 2011. During the three surveys, five bull trout redds were identified. As in redd surveys of Cougar Creek and Pine Creek tributary P8, all identified redds in the mainstem of Pine Creek were flagged and labeled with the date and location of the redd within the stream as well as the redd location recorded with a hand-held GPS unit (Figure 18).

All five of the indentified redds were located along the stream margin. Three of the identified bull trout redds remained visible without the help of flagging for two subsequent surveys following the initial discovery (two weeks), while one remained visible without the use of flagging or GPS coordinates for three weeks. The remaining redd was not re-visited after it was identified during the last survey day. Flows during the entire survey period were stable and water clarity, where not hindered by hydraulic bubble screens, was to stream bottom.

3.5 Lewis River Bull Trout Genetic Baseline Sample Collection

Known Lewis River bull trout spawning streams were electrofished in 2011 for bull trout juveniles. Small tissue samples (less than one square centimeter) were taken from each captured fish for input into the Lewis River bull trout genetic baseline, which was newly established in 2010. The goals of these activities are to continually refine the genetic baseline on an annual basis. Each captured fish was measured to their caudal fork and a small fin clip from the upper lobe of the caudal fin was taken. Tissue samples were preserved in ethanol filled vials provided by the Abernathy Lab.

Each known spawning tributary (Cougar, Rush, and Pine Creeks) was surveyed once in 2011. The lower portion of Cougar Creek was surveyed on July 7th. Twelve bull trout juveniles 48-66 mm in fork length were captured from along the margin and in side-channels of the lower portion of the creek. The lower portion of Rush Creek was surveyed on July 22nd; eleven bull trout juveniles 44-101 mm in fork length were captured. All bull trout juveniles captured in Rush Creek were found in small side-channel habitat off of the mainstem. The stream margins and small side-channels of the mainstem Pine Creek were electrofished on August 12, 2011 from the mouth of tributary P3 upstream approximately 500 m. Eight bull trout juveniles 69-154 mm fork length were captured and sampled for genetic tissue. All bull trout, after capture and fin clip, were returned alive to point of capture.

3.6 Bull Trout Condition Factor (K)

Since 2008, most captured bull trout encountered in the Lewis River basin were weighed to the nearest gram (Map 2.0-1). The goal of gathering this additional biological information is the intent to quantify the condition factor of bull trout in Merwin, Yale, and Swift Reservoirs. This standardized information can then be utilized to compare the condition of reservoir bull trout populations from year to year. K-factor data may also offer insights into reservoir productivity and its potential influence on bull trout spawning migration frequency.

Condition factor is a simple weight-length relation that is generally thought to be one of several indices of healthy fish (Nielson and Johnson 1983). Fulton (1902) established the weight-length relation equation that was used to estimate K-factors in this study.

The Fulton-type equation used is as follows;

K= (W/L^3)*X

Where;

K = metric condition factor
W = weight in grams
L = length in millimeters
X = Arbitrary scaling constant (for our purposes 10^5 was used)

A hand-held scale was used to weigh fish during Lewis River basin netting activities. To weigh bull trout, a landing net or water-filled bucket was attached to the hand-held scale, the scale was allowed to tare to zero, a bull trout was placed in the landing net or water-filled bucket, and the weight was recorded to the nearest gram. The entire time bull trout were out of water if weighed with a landing net was normally under ten seconds. When feasible, bull trout were weighed on land. While in a boat, calm coves were sought out but a measure of inaccuracy was unavoidable due to the pitch and roll of the boat in response to wave action. Biologists felt this inaccuracy was acceptable if it alleviated any added undue stress to the captured bull trout due to over-handling or length of holding time.

A total of 122 bull trout were weighed from the Swift Power Canal, Merwin, Yale and Swift Reservoirs in 2011. Of those fish, 79 were from Swift Reservoir, 32 from Yale Reservoir, six from Merwin Reservoir and five from the Swift Power Canal (not all captured bull trout were weighed in 2011 due to lack of available equipment).

For salmonids, K factor values usually fall between 0.8 and 2.0 (Nielson and Johnson 1983). A K-factor scale was used to filter the data and to help analyze the values for comparison. The scale is based on direct visual observations of all weighed bull trout within the North Fork Lewis

River basin to date, and may adaptively change in the future with the input of additional data. The scale used is as follows:

- less than 0.99 = Poor
- 1.00 – 1.19 = Fair
- 1.20 – 1.39 = Healthy
- greater than 1.40 = Exceptional

Figure 20 represents the percent distribution of weighed bull trout occurrences in the above mentioned K-factor scale. Bars in the graph are divided to represent bull trout from each sampling area. Figure 21 represents condition factors and their correlation to the corresponding fork length for all measured fish (n=122). The regression line indicates a slight statistical correlation existed in 2011 between fish length and condition factor; though not on the magnitude that was expected or observed in prior years, the larger size-class bull trout exhibited a slightly higher condition factor than the smaller size-class fish (Figure 21). Data sets from both the Swift Power Canal, Merwin and Yale Reservoir were limited due to the low number of fish collected and handled (n=5 in Swift Power Canal, n=6 in Merwin and n=32 in Yale), especially when compared to Swift Reservoir (n=79).

Median condition factor values were 1.25 for fish sampled in the Swift Power Canal, 1.31 for fish sampled from Merwin Reservoir, 1.19 for fish sampled in Yale Reservoir, and 1.15 for fish sampled in Swift Reservoir. The median condition factor for all bull trout combined in 2011 was 1.19. When comparing numeric fish condition factors, care needs to be taken to only compare fish of like fork lengths (Anderson and Gutreuter 1983). Figure 22 compares bull trout lengths to weights recorded and the corresponding curve established by this relationship.

To quantify variation within the 2011 condition factor data-set, the coefficient of variation (%CV) was computed and represented in percent format. Coefficient of variation is the standard deviation of a sample divided by the arithmetic mean; this number is then multiplied by 100 to convert to percent CV. The coefficient of variation from the entire bull trout condition factor sample in 2011 was 21%.

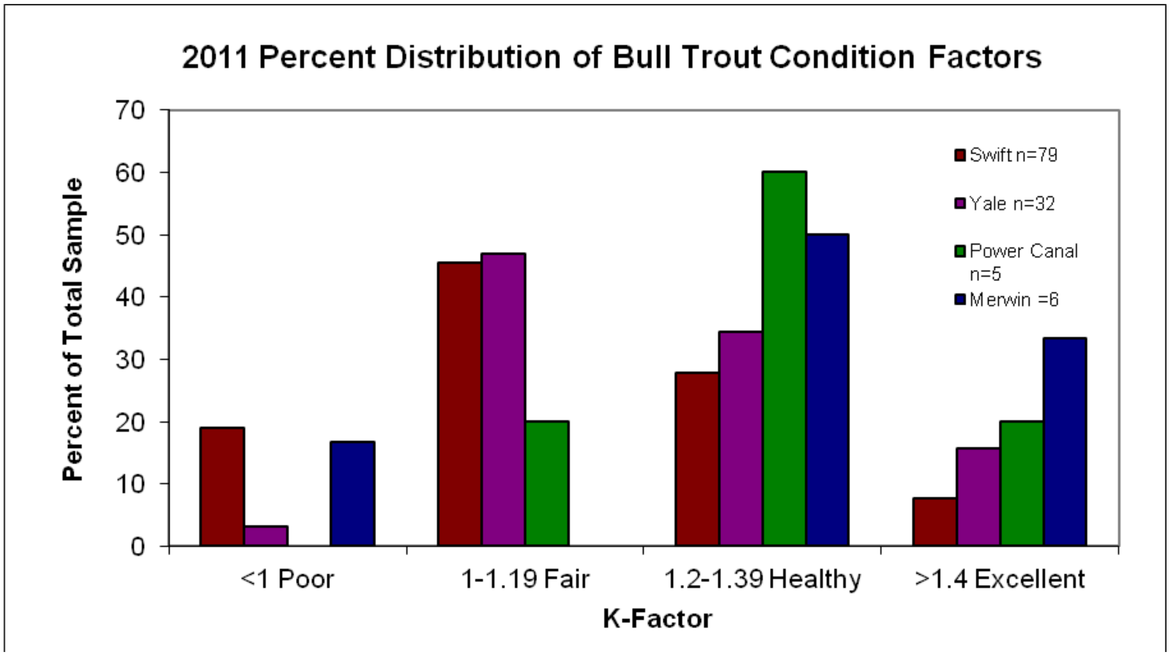

Figure 20. Percent distribution of all weighed bull trout in 2011 over established Lewis River condition factor scale.

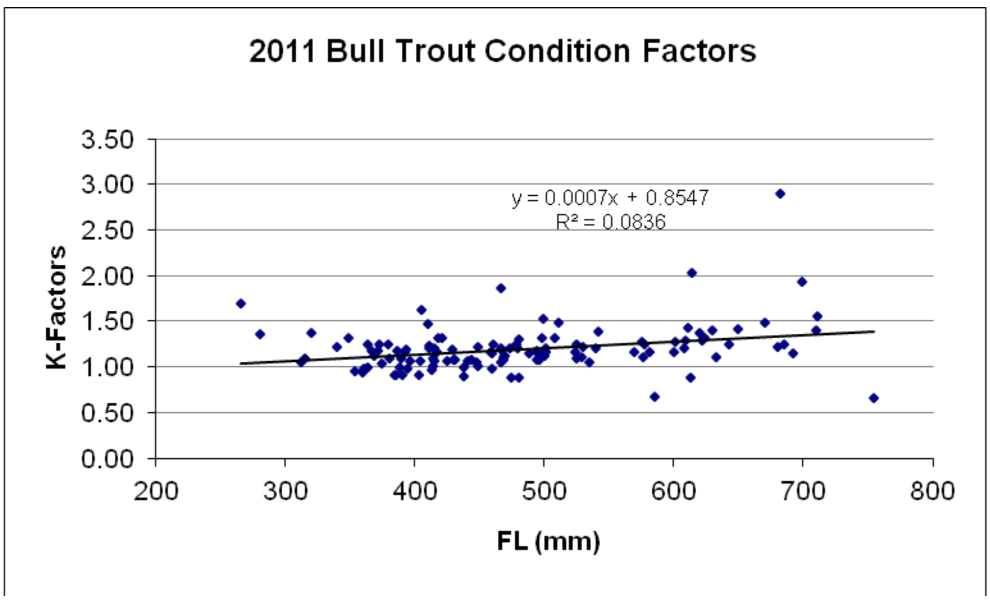

Figure 21. Individual bull trout condition factors in relation to corresponding fork lengths for entire sample from all sample areas combined in 2011. Each point represents an individual bull trout.

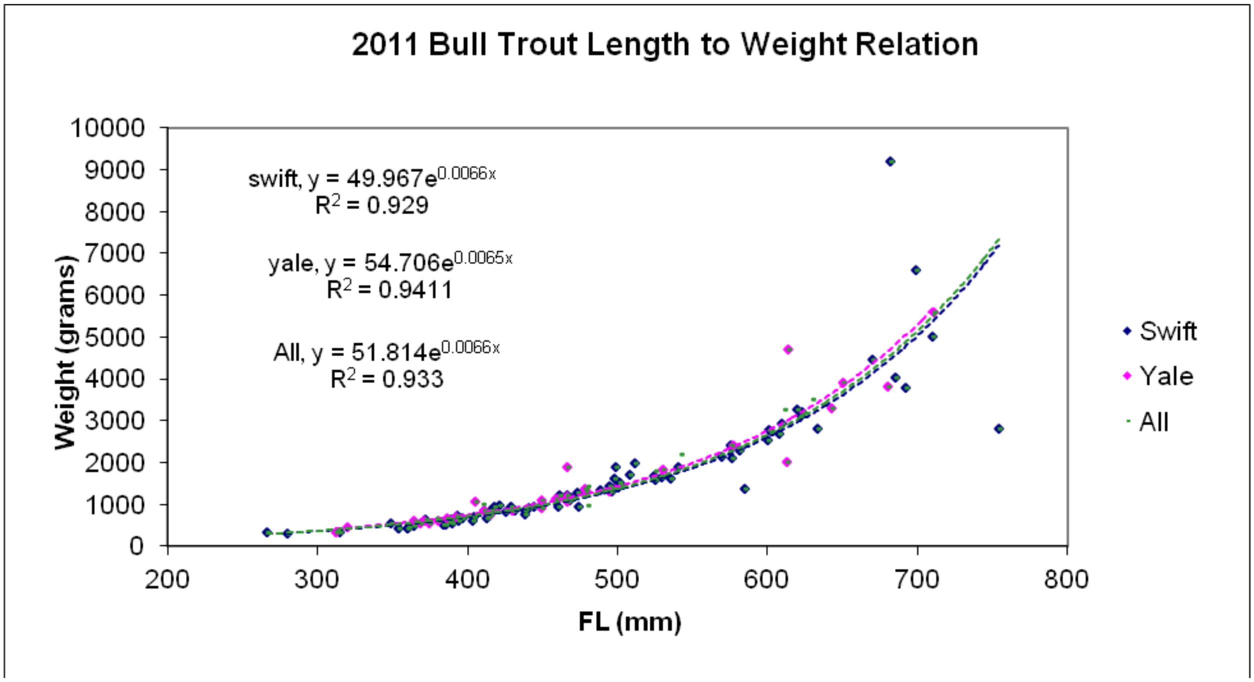

Figure 22. Bull trout length to weight relation curve observed in 2011. Each dot represents an individual fish.

4.0 Discussion

As directed in Article 402 of the Federal Energy Regulatory Commission issued operating licenses for Merwin, Yale, Swift No.1, and Swift No.2 hydroelectric projects (issued June 26, 2008) and pursuant to Section 9.6 and 4.9 of the Lewis River Settlement Agreement, the Utilities are to monitor bull trout populations in Swift Reservoir and Yale Reservoir annually as well as annually capture and transport bull trout from the Yale powerhouse and Swift No.2 tailrace areas. The Utilities collected the data contained in this report to accomplish these mandated monitoring objectives.

The estimated number of bull trout that staged in the Eagle Cliffs area at the head of Swift Reservoir in the spring/summer and then migrated upstream the North Fork Lewis River in the summer/fall slightly decreased in 2011. The 2011 decrease from the 2010 estimate was not large (536 in 2010 vs. 414 in 2011, or 23 percent decline). This migration estimate has remained relatively stable since 2007, with estimates ranging from 380-536. Of note in 2011, was the absence of bull trout less than 539 mm observed within the spawning tributaries as identified by instream PIT tag detectors. Though 69% (59 of 86 tagged) of the migration estimate tag group consisted of fish less than 539 mm, only three were detected moving upstream into one of the spawning tributaries, where the main recapture areas are located. Most 2011 tagged bull trout greater than 539 (18 detected of 27 tagged) were documented migrating up a spawning tributary and thus where available for recapture during snorkel surveys. A major assumption within all closed population mark/recapture estimates is that every tagged individual has an equal opportunity to be recaptured during recapture events. If a large portion of the tagged group is not available for recapture, this positively skews the abundance estimate as the number of recaptures can only be as great as the number of tagged individuals available for recapture in the area surveyed.

New in 2011, was the construction and operation of instream half-duplex PIT tag antennas in Pine and Rush creeks. The antenna operated in Cougar Creek in 2010 continued to function through the bull trout spawning time-period in 2011. All antennas were stream-width and of a flat-plate design (antenna cable located on the stream bottom). The Rush and Pine antennas began operation at the end of July and were functional through the bull trout spawning period. Thirteen individual bull trout were detected migrating upstream Cougar Creek during bull trout spawn time. Seventeen individual bull trout were detected moving past the Pine Creek antenna while eight individual bull trout were detected moving past the antenna located in Rush Creek. Valuable information concerning migration timing, periodicity, and size at migration was gathered during 2011 PIT tag antenna operations in the Lewis River basin.

Bull trout captures in the Yale powerhouse tailrace increased in 2011 over 2010 (six to one), capture methods (tangle nets) and total effort (six netting days) was similar to past collection years. New in 2011 was the holding of all captured Yale powerhouse tailrace bull trout at Speelyai Hatchery while rapid response genetic analysis was conducted. All bull trout captured in Merwin in 2011, after genetic analysis, were found to be of Cougar Creek origin and were transported for release into Yale Reservoir. New methodologies to capture these fish continue to be investigated, though at this time tangle nets remain the most effective and efficient. With the construction in late 2009 of the Yale Entrainment Reduction Net, pursuant to section 4.9.3 of the Lewis River Settlement Agreement, capture numbers of bull trout in the Yale powerhouse tailrace are anticipated to continue to decline. In addition, a barrier net for the Yale spillway will be installed by the end of 2012 which should further reduce the presence of bull trout in the Yale tailrace.

Collection and tagging methods within the Swift Bypass Reach continued relatively unchanged in 2011 with one exception concerning protocol and captured fish disposition. All captured Swift Bypass Reach bull trout in 2011 were held at Speelyai Hatchery while rapid response genetic analysis was performed. Bull trout that scored high enough in a Likelihood of Origin Analysis (greater than 99 percent) to a Swift Reservoir population were transported upstream and released into Swift, while bull trout that did not meet the scoring criteria were released back into Yale Reservoir. Capture numbers in 2011 (32) were consistent with what was encountered in 2010 (27). Fifteen of the 32 Swift Bypass Reach bull trout captures, after analysis, were found to be endemic to a Swift Reservoir local population (Rush or Pine) and so were transported upstream for release into Swift. The remaining seventeen captures were either endemic to the Cougar Creek local population or did not score high enough in the Likelihood of Origin analysis to Rush or Pine Creek and were released back to Yale Reservoir.

For the third consecutive year, the Swift Power Canal water conveyance that connects the Swift No. 1 powerhouse to the Swift No. 2 dam was surveyed for the presence of bull trout. The catch rate in 2011 (5) was consistent to what was observed in 2010 (6). Methods and duration of capture activities remained consistent with 2010 activities. All captured bull trout, after biological examination, were transported upstream and released into Swift Reservoir.

Bull trout redd count methodology continued in Cougar Creek to quantify the bull trout spawning population residing in Yale Reservoir. Bull trout redds observed in the creek and the number of bull trout observed during the peak foot count in 2011 was slightly more than in 2010. This spawning population has established a stable trend since 2009. Multiple redd surveys encountered bull trout physically on redds and at times in the process of excavating. Information concerning a bull trout-per-redd expansion factor is still needed. The underwater video captured from Cougar Creek in 2009 and 2010 was analyzed for numbers of migrating bull trout. It was anticipated the data from the underwater video camera would be able to add additional information to the fish-per-redd expansion number, but based on bull trout migration patterns recorded by the Cougar Creek PIT tag antennas, this method does not provide an acceptable adult-per-redd estimate for Cougar Creek and will not be continued. An alternative method for developing an adult-per-redd expansion factor is still needed.

The 2011 bull trout redd counts in Pine Creek tributary P8 were greater than counts from 2010. The mainstem Pine Creek bull trout redd surveys were again successful in locating and monitoring multiple bull trout redds in a section of Pine Creek. Bull trout redd life was again established and consisted of redds remaining visible for at least two weeks in Pine Creek during the 2011 season. How long redds persist in Pine Creek from one year to the next is information that will continue to be collected in future years as this data will be paramount when evaluating resident and anadromous fish spawning interactions slated to begin after full anadromous fish reintroduction begins in 2012.

Genetic samples from bull trout juveniles were taken from all three known local populations (Cougar, Rush, and Pine) in 2011. These samples will be added to the current Lewis River bull trout genetic baseline with the intent to capture genetic variation that may or may not occur from one generation to the next. It is anticipated that a representative genetic sample will be gathered from each local population annually.

Weights of most handled bull trout were again collected in 2011. Individual weights were then compared to corresponding fork lengths and fish condition factors were assigned. The number of weights recorded in 2011 (122) is similar to 2010 (117). When the calculated condition factors of like-sized individuals were compared, the year 2011 showed a slight overall K-factor increase from 2010 for all size-classes in all areas collected except Swift Reservoir. Median values observed in Swift Reservoir in 2011 were less than 2010 and 2009 (2009=1.28, 2010=1.20, 2011=1.15), while median condition factors of fish residing in Yale Reservoir were higher in 2011 than 2010 (2010=1.13, 2011=1.19). Condition factors of bull trout residing in the Swift Power Canal in 2011 were higher than what was observed in 2010 (2010=1.20, 2011=1.25). It is anticipated that condition factor information may offer insight into reservoir productivity as it relates to bull trout, and the overall health of individual bull trout. This information can then be related to how fish condition may affect bull trout behavior especially in terms of reproduction and year-to-year spawning behavior.

Due to logistical constraints with purchasing and holding/transporting dry-ice, no tissue samples from bull trout for the specific reason to perform Stable Isotope Analysis were collected in 2011.

5.0 Acknowledgements

The Utilities would like to thank Mark Ferraiolo of the USDA-FS who served as the primary field assistant. His efforts during 2011 field activities were invaluable. We wish to thank Jim Byrne from WDFW for his assistance during the Swift Reservoir migration estimate field activities and data analysis.

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APPENDIX A

2011 Swift Reservoir Bull Trout Capture Database

Record #	Floy tagged Capture #	DATE	LENGTH (mm)	FLOY COLOR	FLOY No.	HDX PIT	RECAP COLOR	RECAP	REMARKS	Weight (grams)
1538	n/a	4/26/2011	463	n/a	n/a	F6542			23mm HDX PIT/dorsal sinus. Pre-opening day sampling	n/a
1539	1	5/13/2011	572	white	001/002	AOF6543				N/A
1540	2	5/3/2011	532	white	003/004	AOF6544			SKINNY FAT HEAD	n/a
1541	3	5/3/2011	579	white	005/006	AOF6545	LOST TAG	3D9257C6A3BE5	FADED Y-TAG TAGGED 7/3/08	n/a
1542	4	5/18/2011	654	white	007/008	AOF6546	YELLOW 60	3D9IHIC2C489498	DRIFT SCARS MIN AD FIN	
1543	5	5/18/2011	605	white	009/010	AOF6547		3D9IHIC2C4578E3	RECENTLY HOOKED	
1544	6	5/18/2011	550	white	011/012	AOF6548				
1545	7	5/24/2011	482	white	013/014	AOF654A				
1546	8	5/24/2011	486	white	015/016	AOF654B			FISH IN THROAT	
1547	9	5/24/2011	470	white	017/018	AOF6549				
1548	10	5/24/2011	550	white	019/020	AOF654C				
1549	11	6/1/2011	576	white	021/022	AOF654D	PINK 72 & CHART/RED 6	3D91C2C456B91	CUT TAGS OFF	2120
1550	12	6/1/2011	403	white	023/024	AOF654E				600
1551	13	6/1/2011	N/A	white	n/a	n/a			FISH STREESED/ RELEASED	N/A
1552	14	6/1/2011	361	white	025/026	AOF654F				460

1553	15	6/7/2011	444	white	028/030	AOF6550			WATER VIS 1 FT HIGH RUN OFF	940
1554	N/A	6/13/2011	266	N/A	N/A	071158C8OC587264				320
1555	n/a	6/13/2011	280	N/A	N/A	071158C8OC583660			HOOKING INJURY	300
1556	16	6/13/2011	623	white	031/032	AOF6554	PINK FLOY PPW/WDFW 151	3D9257C66AEB8		3200
1557	17	6/13/2011	495	white	033/034	AOF6555			HOOK IN THROAT	1400
1558	18	6/13/2011	390	white	035/036	AOF6556				540
1559	19	6/13/2011	441	white	037/038	AOF6557			HOOK IN THROAT	920
1560	20	6/13/2011	461	white	039/040	AOF6558				1222
1561	21	6/13/2011	620	white	041/042	AOF6559	BLUEW WDFW 143	3D91C2C456F7C		3280
1562	n/a	6/17/2011					THIS YEAR	AOF654D	PRIOR WEEK	N/A
1563	22	6/17/2011	682	white	043/044	AOF655A		3D91BF24053FC	JAW TORE UP	9200
1564	23	6/17/2011	500	white	045/046	AOF655B				1400
1565	24	6/17/2011	575	white	047/048	AOF655C		3D600053F64A1	ODD HALO COULD BE HYBRID	2420
1566	25	6/17/2011	692	white	049/050	AOF655D		3D91BF24058C0		3800
1567	26	6/17/2011	622	white	051/052	AOF655E		3D600053FD930	FEW HALOS	3100
1568	27	6/17/2011	754	white	053/054	AOF655F				2800
1569	28	6/17/2011	608	white	055/056	AOF6560		3D6000053FD630		2700
1570	29	6/17/2011	498	white	057/058	AOF6561				1620
1571	30	6/17/2011	710	white	059/060	AOF6562				5020

1572	31	6/17/2011	609	white	061/062	AOF6563				2920
1573	32	6/17/2011	525	white	063/063	AOF6565				1580
1574	33	6/17/2011	396	white	065/066	AOF6566				660
1575	34	6/17/2011	699	white	067/068	AOF6567		3D91BF10E74D2		6600
1576	35	6/23/2011	670	white	069/070	AOF656D			SLIGHT HALOS	4460
1577	36	6/23/2011	425	white	071/072	AOF656C				820
1578	37	6/23/2011	581	white	073/074	AOF656E				2280
1579	38	6/23/2011	474	white	075/076	AOF656F			NO HALOS. NEED GENETIC LABEL	940
1580	39	6/23/2011	685	white	077/078	AOF6570			NO HALOS LINE OUT VENT	4020
1581	40	6/23/2011	569	white	079/080	AOF6571				2140
1582	41	6/23/2011	511	white	081/082	AOF6572		3D600053FF2F9	RECAP	1980
1583	42	6/23/2011	385	white	083/084	AOF6573				520
1584	43	6/23/2011	600	white	085/086	AOF6574		3D9257C6A5D79	FLOY TAG MISING SHEATH, CUT RECAP	2520
1585	44	6/23/2011	499	white	087/088	AOF6575		3D600053FD8F4	FLOY TAG MISING SHEATH, CUT RECAP	1900
1586	45	6/23/2011	601	white	089/090	AOF6576	YELLOW 66	3D91C2C46DBE8	RECAP	2780
1587	46	6/23/2011	633	white	091/092	AOF6577		3D91C2C4611AA	RECAP	2820
1588	47	6/23/2011	585	white	093/094	AOF6578				1360
1589		6/29/2011					THIS YEAR 45		RECAP	

1590	48	6/29/2011	414	white	095/096	A89AF84				720
1591	49	6/29/2011	448	white	097/098	A89AF83				940
1592	50	6/29/2011	438	white	099/100	A89AF82				760
1593		6/29/2011	315	white	N/A	A89AF81				340
1594		6/29/2011	349	white	N/A	A89AF80				560
1595		6/29/2011					THIS YEAR 8		MISSING ONE FLOY/FOUND IN NET	
1596	51	6/29/2011	473	white	101/102	A89AF7F				1280
1597	52	6/29/2011	501	white	103/104	A89AF7E				1460
1598	53	6/29/2011	497	white	105/106	A89AF7D		3D600053FD744	HALOS VERMICULATIONS	1360
1599	54	6/29/2011	388	white	107/108	A89AF7C				580
1600	55	6/29/2011	469	white	109/110	A89AF7B				1160
1601	56	6/29/2011	421	white	111/112	A89AF7A				985
1602	57	6/29/2011	431	white	113/114	A89AF79				860
1603	58	6/29/2011	414	white	115/116	A89AF78				780
1604	59	6/29/2011	501	white	117/118	A89AF77				1520
1605	60	6/29/2011	671	white	119/120	A89AF76		3D91BF2406828	RECAP	n/a
1606	61	6/29/2011	468	white	121/122	A89AF75			RECAP WITH NO FLOY	1100
1607	62	6/29/2011	417	white	123/124	A89AF74				840
1608	63	7/6/2011	394	white	125/126	A89AF70				600
1609	64	7/6/2011	354	white	127/128	A89AF6F				420
1610	65	7/6/2011	384	white	129/130	A89AF6E				520

1611	66	7/6/2011	468	white	131/132	A89AF6D	CHARTREUSE 076	3D600053FD77E	RADIO TAG - LOOKS GOOD	1140
1612	67	7/6/2011	415	white	133/134	A89AF6C				860
1613	68	7/6/2011	535	white	135/136	A89AF6B				1620
1614	69	7/6/2011	460	white	137/138	A89AF6A			MISSING ONE EYE	960
1615		7/6/2011					THIS YEAR 103/104		RECAP	n/a
1616	70	7/6/2011	524	white	139/140	A89AF69				1680
1617		7/6/2011					THIS YEAR 117/118		RECAP	n/a
1618		7/14/2011					THIS YEAR 107/108		RECAP	
1619		7/14/2011		white			THIS YEAR 137/138		RECAP	
1620	71	7/14/2011	360	white	141/142	A89AF64			RAIL THIN	440
1621	72	7/14/2011	438	white	143/144	A89AF63				840
1622	73	7/14/2011	496	white	145/146	A89AF62			OLD WOUND LATERALLY NEAR DORSAL	1320
1623	74	7/14/2011	389	white	147/148	A89AF61				640
1624	75	7/14/2011	494	white	149/150	A89AF60				1420
1625	76	7/14/2011	364	white	151/152	A89AF5F				480
1626	77	7/14/2011	488	white	153/154	A89AF5E				1340
1627	78	7/14/2011	466	white	155/156	A89AF5D				1220
1628	79	7/14/2011	393	white	157/158	A89AF5C				720
1629	80	7/14/2011	529	white	159/160	A89AF5B				1640
1630	81	7/14/2011	413	white	161/162	A89AF5A				680

1631	82	7/14/2011	418	white	163/164	A89AF59				960
1632		7/20/2011					THIS YEAR 139/140		RECAP	n/a
1633		7/20/2011					THIS YEAR 131		RECAP	n/a
1634	83	7/20/2011	372	white	165/166	A89AF58				640
1635	84	7/20/2011	540	white	167/168	A89AF57				1900
1636	85	7/20/2011	508	white	169/170	A89AF56				1720
1637	86	7/20/2011	429	white	171/172	A89AF55				940
1638	87	7/20/2011	404	white	173/174	A89AF54			HOOK & LINE IN MOUTH	700

APPENDIX B

2011 Swift Bypass Reach Bull Trout Capture Database

Capture #	Record #	Date	F.L. mm	HDX PIT	Recap Color	Recap PIT #	Genetic Vial #	Weight (grams)	Comments	Transported to
93	71	6/8/2011	374	AOF6551	N/A	N/A	LBU55	540	Swift Bypass reach tangle net capture	Yale
94	72	6/20/2011	643	A0F6568	N/A	N/A	2030-001	3300	Set net @ mouth of bypass reach. Halos	Swift
95	72	6/20/2011	380	AOF6569	N/A	3D600087E406A	2030-002	600	Set net @ IP Hole	Yale
96	72	7/5/2011	614	A89AF73	N/A	3D600053FB20B	2030-009	4700	Mouth of bypass reach -missing floy	Swift
97	73	7/5/2011	494	A89AF72	N/A	N/A	2030-010	1300	mouth of bypass reach -set net	Swift
98	74	7/5/2011	613	A89AF71	N/A	N/A	2030-011	2020	mouth of bypass reach -set net blind in left eye	Yale
99	75	7/11/2011	415	A89AF68	N/A	N/A	2030-012	760	Mouth of bypass -set net	Yale
100	76	7/11/2011	460	A89AF67	N/A	N/A	2030-013	1120	mouth of bypass set net, coho in mouth	Yale
101	76	7/11/2011	711	A80F658D	white 18	3D600053FF56D	2030-014	5600	mouth of bypass set net, coho in mouth, halos on dorsal, vermiculi	Yale
102	76	7/11/2011	650	A89AF66	N/A	3D91C2CE9E4BD	2030-015	3900	Mouth of bypass set net, missing RP fin, missing floy	Swift
103	76	7/25/2011	680	A89AF53	N/A	3D600053FCAD1	N/A	3820	missing floy, recap	Swift
104	77	7/25/2011	392	A89AF52	N/A	N/A	2030-017	700		Swift
105	78	7/25/2011	449	A89AF51	N/A	N/A	2030-018	1100		Swift
106	79	7/25/2011	368	A89AF50	N/A	N/A	2030-019	560		Yale
107	80	7/25/2011	364	A89AF4F	N/A	N/A	2030-020	600		Yale

108	81	7/25/2011	466	A89AF4E	N/A	N/A	2030-021	1880		Yale
109	82	7/25/2011	371	A89AF4D	N/A	N/A	2030-022	600		Yale
110	83	7/25/2011	479	A89AF4C	N/A	N/A	2030-023	1320		Swift
111	84	7/25/2011	466	A89AF4B	N/A	N/A	2030-024	1200		Yale
112	85	7/25/2011	312	A89AF49	N/A	N/A	2030-025	320		Yale
113	86	7/25/2011	466	A90AF48	N/A	N/A	2030-026	1060		Swift
114	87	7/25/2011	411	A89AF45	N/A	N/A	2030-027	860		Yale
115	88	8/1/2011	411	A89AF42	N/A	N/A	2030-028	840	mouth of bypass set net	Yale
116	89	8/1/2011	320	A89AF41	N/A	N/A	2030-029	450	mouth of bypass set net, new puncture wound/predation	Swift
117	90	8/1/2011	405	A89AF40	N/A	N/A	2030-030	1080	mouth of bypass set net	Swift
118	91	8/1/2011	459	A0F65A6	N/A	N/A	2030-031	1120	IP hole of bypass hook & line	Yale
119	92	8/8/2011	530	A89AF3E	N/A	N/A	2030-032	1820	set net mouth of bypass	Swift
120	93	8/8/2011	577	A89AF3D	N/A	N/A	2030-033	2400	hook & line mouth of bypass	Swift
121	94	8/8/2011	478	A89AF3C	N/A	N/A	2030-034	1360	set net IP hole	Swift
122	95	8/8/2011	449	A89AF3B	N/A	N/A	2030-035	920	Hook & Line IP hole, male	Yale
123	96	8/8/2011	386	A89AF3A	N/A	N/A	2030-036	680	Hook & Line IP hole, male	Yale
124	97	8/8/2011	430	A89AF39	N/A	N/A	2030-037	860	Set net IP hole	Swift

Attachment E

Hatchery and Supplementation Program 2012 Annual Plan

2012

Annual Operating Plan
FINAL

HATCHERY AND SUPPLEMENTATION PROGRAM
NORTH FORK LEWIS RIVER

Prepared by

the

North Fork Lewis River
Hatchery and Supplementation Subgroup

February 10, 2012

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EXECUTIVE SUMMARY

The purpose of this annual operating plan (AOP) is to describe the methods and protocols necessary to implement components of the Hatchery and Supplementation Plan (H&S Plan). The methods described in this plan represent the collaborative efforts and input of the Hatchery and Supplementation Subgroup (HSS). The HSS was formed under the Lewis River Aquatics Coordination Committee (ACC) to finalize the H&S Plan, and to guide reintroduction of anadromous species upstream of the hydroelectric projects on the North Fork Lewis River. This AOP is required under Section 8.2.3 of the Lewis River Settlement Agreement. Section 8.2.3 states that, at a minimum, the AOP must contain the following information

(1) A production section specifying the species and broodstock sources

(2) Current hatchery target and juvenile production target

(3) A release section identifying, by species, the rearing schedule and planned distribution of fish and the schedules and location for release

(4) A list of facility upgrades to be undertaken in the current year

(5) A description of relevant monitoring and evaluation to be undertaken

In addition to these items, the Hatchery and Supplementation Plan specifies various life history and performance objectives associated with program implementation and hatchery operations. Methods to meet these objectives are provided in the monitoring and evaluation section of this plan. These objectives common to all three species are summarized below and shall be reviewed on an annual basis.

<u>Life History and Monitoring Objectives</u>

- Determine adult composition (hatchery vs. wild) on spawning grounds downstream of Merwin dam
- Determine spatial and temporal distribution of spawning fish
- Estimate adult abundance downstream of Merwin dam
- Estimate juvenile abundance (reproductive success) downstream of Merwin dam
- Estimate juvenile migration and residualism of hatchery releases downstream of Merwin dam
- Hatchery juvenile monitoring for ecological interactions with wild smolts

<u>Hatchery Performance Data Collection</u>

- Environmental rearing conditions in the environment by life stage
- Tracking consistency of programs with HSRG guidelines
- Disease presence and loss by life stage

- Survival by life stage
- Growth rate by month from fry ponding to release as smolts
- Number of fish tagged, tag type and purpose (experimental, production, other?)
- Number of adult collected, spawned, recycled, disposition
- Number of wild fish collected, origin and disposition
- Number of hatchery fish collected that originated from outside of the Lewis River basin (based on CWT tag data)

Many of these data are routinely provided by hatchery staff and presented in hatchery annual reports. Some items however, such as "tracking consistency with HSRG guidelines" is new and is the responsibility of the Hatchery and Supplementation subgroup to monitor and report to the ACC. All results from various monitoring and evaluation activities will be presented annually as part of the Lewis River operations report.

This plan consists of three main sections: winter steelhead, spring Chinook and coho salmon. Each section will have identical headers and numbering to maintain consistency within this document and make it easier to locate information. Other sections include a monitoring and evaluation (Section IV) and a summary of reporting requirements (Section V). A list of hatchery upgrades proposed for 2012 is provided in Appendix A of this plan. Appendix B provides an illustrated schedule of monitoring and evaluation activities.

Program Coordination

In order to implement this detailed work plan, a single program coordinator will ensure that various concurrent and sequential components of the program are completed in an organized manner. Throughout the work plan, the H&S program coordinator will coordinate with specific project component leads to make key decisions and ensure that the objectives and tasks are completed on schedule.

The program coordinator will be responsible for coordinating the following general tasks with WDFW, PacifiCorp, and other participating ACC entities

1) Implement protocol for genetic screening and broodstock assignment – in conjunction with Genetics Lab (winter steelhead program)
2) Coordination with Merwin Hatchery management staff for implementation of spawning and rearing protocols
3) Ensuring that implementation activities follow plan procedures and methods
4) Provide status updates to ACC and HSS
5) Coordination with field staff
6) Coordination of monitoring and evaluation efforts, data collection and production of program reports

SECTION I. WINTER STEELHEAD

1.0 Introduction

Implementation of the wild winter steelhead program differs from other reintroduction species in that adults collected (without snout wire tags) are not transported upstream, but rather held at the Merwin hatchery for spawning. Each fish is sampled for genetic assignment analysis. Only wild broodstock that have acceptable genetic assignment (see Section 2.6) are spawned at the facility. Wild steelhead with unacceptable assignment are returned to river, or in some cases removed from the system. The success of this program depends predominately on returns to the traps from the wild broodstock rearing programs at the hatchery. All returning adults from this program (possess a wire snout tag) are to be transported upstream of Swift dam to spawn naturally.

2.0 Program Implementation

The following sections describe the detailed protocols for implementation of the natural origin winter steelhead portion of the H&S Plan.

2.1 Broodstock Collection

The objective of the natural origin winter steelhead portion of the H&S Plan is to produce steelhead from wild origin adults within a hatchery environment for reintroduction upstream of hydroelectric projects on the Lewis River. To produce fish with the best chance of utilizing habitat available upstream of the projects, the program should strive to capture broodstock without the influence from hatchery steelhead programs. To ensure maximum genetic adaptability it is necessary to use stock(s) endemic to the North Fork Lewis River or in some instances within the Cascade Stratum.

Broodstock collection will be divided into two phases. The first phase of broodstock collection (January 23 to March 31) will only incorporate fish with genetic assignment to North Fork Lewis River or Cedar Creek stock. During this phase, the likelihood of encountering unmarked fish derived from hatchery stocks is greater than later in the spring. Also, any females that ripen before genetic assignment is complete (during phase I) will be released. The second phase of broodstock collection (April 1 through the end of collection) will also give priority to fish with genetic assignment to North Fork Lewis River stock; however, the likelihood of encountering unmarked hatchery derivatives during this phase is reduced. Therefore, ripe females caught in river or by trap may be available for broodstock immediately, prior to genetic assignment. Ripe females will be spawned with males that have genetic assignment to the North Fork Lewis River stock. After genetic assignment, resulting crosses may include wild winter steelhead from within the Cascade Stratum. If females assign outside of the Cascade Stratum, final disposition of eggs resulting from these crosses will be determined in consultation with NOAA Fisheries. If females collected during Phase 2 are not ripe, they should undergo the normal genetic assignment protocol before spawning. If an insufficient number of North Fork Lewis River spawners are available to meet egg take goals, in-season decisions may be made by the program coordinator in consultation with WDFW and NOAA Fisheries to incorporate fish from the Cascade Stratum.

All fish captured will be wanded for the presence of a blank wire tag in the snout and PIT tags. All winter steelhead captured at the Merwin Trap and Lewis River ladder with positive wire detections shall be transported upstream of Swift Dam. Winter Steelhead transported upstream will be measured and recorded as male or female to keep track of sex ratio of transported adults. A genetic punch will be taken from each transported steelhead for pedigree analysis. In-river captures that have a blank wire will be PIT tagged and released to determine migratory behavior (e.g., trap timing) upon recapture.

There is known blank wire tag loss that occurs for each brood year. Therefore, captured fish that lack a wire snout tag, but have stubbed dorsal fins will be returned to river after being sampled for genetic analysis. In future years, after the ability and accuracy to perform pedigree analysis is fully understood, these fish may be retained until genetic assignment results are known. Depending on the results, these fish may be transported upstream, released back to river, killed, or used for broodstock.

2.1.1 Broodstock Collection Goal

Up to 50 natural origin winter steelhead spawned (25 male, 25 female) annually.

2.1.2 Broodstock Source

100 percent natural origin winter-run steelhead (as identified by an intact adipose fin) from the North Fork (NF) Lewis River (including Cedar Creek and select tributaries) population and confirmed by genetic assignment. (See section 3.1.5 – Genetic Assignment Analysis).

2.2 Collection Locations

Four locations in the lower NF Lewis River basin have been identified for broodstock collection in 2012:

1) The Merwin Dam adult trap,
2) The Lewis River Hatchery Ladder,
3) The Cedar Creek weir/adult trap, and
4) The North Fork Lewis River downstream of Merwin Dam.

While the trapping facilities at Merwin Dam, Lewis hatchery ladder and Cedar Creek weir offer the most straight-forward means of capturing natural origin winter steelhead, recent annual returns confirm that relying on collections from the traps alone may not provide sufficient numbers or sex ratios of winter steelhead to meet program goals. In addition, it is desirable to collect broodstock from multiple locations to increase the probability that the genetic diversity of the stock is represented.

2.3 Collection Methods

2.3.1 Merwin Dam Adult Trap

The standard operating procedure for the Merwin Fish Collection Facility (FCF) is to clear the trap on a daily (weekday) basis, depending on flows. Washington Department of Fish and Wildlife (WDFW) hatchery or PacifiCorp staff will operate the trap and sort and processes fish following established protocols.

2.3.2 Lewis River Ladder

The Lewis River hatchery will provide capture, sorting and transportation of winter steelhead. The frequency of trap operation will occur daily (Monday – Friday),

2.3.3 Cedar Creek Weir/Adult Trap

Collections, if necessary, will occur at the Cedar Creek weir, rather than the Grist Mill fishway trap for two reasons: First, timing at the weir is most representative of the population, and secondly, fish captured at the Grist Mill fishway trap need to be marked and released for mark-recapture population estimates. All unmarked steelhead captured at the Grist Mill will be tagged with a PIT tag and a fin punch will be taken for genetic analysis. The PIT tag will allow for easy and accurate identification upon recapture.

WDFW staff checks the weir trap daily as part of routine trapping operations. Natural origin steelhead will be scanned with a PIT tag reader and, if necessary, retained for broodstock. All non adipose clipped steelhead will also be wanded for the presence of blank wire snout tags. Cedar Creek personnel will coordinate with Merwin Hatchery staff for processing and transport of fish to the Merwin Hatchery if the need arises.

2.3.4 Lower NF Lewis River

Based on previous experience in 2010 and 2011, tangle netting will be the only method employed for in-river capture. Success in collecting fish in the lower NF Lewis River depends greatly on river flow conditions and visibility.

2.3.4.1 Targeted tangle net drifts - Monofilament tangle nets of 4-inch stretch mesh will be drifted in known steelhead holding areas between Merwin Dam and downstream end of Eagle Island. Nets will vary between 75 and 150 feet long and will have a depth of approximately 6 feet. Nets should be dyed dark green and have approximate monofilament test strength of no more than 8 pounds to increase effectiveness. Netting will occur weekly between March 1 and May 15. Boat(s) will be used to drift nets in known holding areas. Each boat will be comprised of one boat operator and one net handler.

PacifiCorp field crews will determine whether to release tangle net caught hatchery winter steelhead. This determination will be made in the field and will be based on the following protocol: *a hatchery fish will be released if it is determined to be a kelt or a green "bright" hatchery fish*. All hatchery ripe or near ripe fish will be retained and transported to the hatchery alive where they will be surplused. These fish will be made available to the Yakama Nation.

For 2012, field crews will obtain genetic samples from "green" hatchery fish to determine whether they are summer or winter steelhead.

2.4 Transport of Captured Steelhead

Transport tanks (e.g., Yeti® insulated coolers) will be used on boats to protect and hold captured fish. To reduce stress, lids will remain closed and bubblers will be used during transit to aerated holding tanks on shore. Rubber mesh nets or fish transport tubes (e.g. rubber inner-tubes or PVC tubes), partially filled with river water, will be used to transport steelhead from the boats to the aerated tank on shore. The gravel bar at Lewis River hatchery will be used as the primary location for the aerated tank as it represents a central location for collection activities. Hatchery staff will be notified when fish are placed in the aeration tank. Fish will be transported to Merwin hatchery by hatchery staff and held in the adult holding area to await genetic assignment results.

2.5 Collection Timing and Goals

Broodstock collection at all locations should occur proportionately over the entire run timing of the North Fork Lewis wild winter steelhead return. Collection guidelines for the natural origin steelhead portion of this plan were initially developed based on Kalama River run-timing, which is thought to best approximate historical North Fork Lewis River wild winter steelhead timing (B. Glaser, WDFW, memo to Erik Lesko, Jan. 29, 2009). As run timing information becomes available from Lewis River broodstock collection, the run curve will be modified to represent actual Lewis River timing. Collection goals were established for each collection location at 15 day intervals (periods) to maximize genetic variation and minimize localized impacts for each location (Table I-1). It is important to note that collections from Cedar Creek will only be used if insufficient broodstock are collected from either the mainstem traps or through in river tangle netting.

Collection goals represent the number of broodstock needed for each interval. Additional fish captured may be needed during each interval to achieve collection goals if captured fish do not have genetic assignment to natural origin NF Lewis or Cedar Creek stocks. Collection goals should be used as a guideline to direct in-season collections. Cumulative collection goals are often the most useful for in-season management. Adaptive management should be employed to address actual in-season conditions and proportions. Collections from the mainstem NF Lewis locations (Merwin Dam, Lewis River ladder and in-river netting) are preferred and weekly review of collections should occur to determine if fish are needed from Cedar Creek. As a last resort, a maximum limit of up to 20% (10 fish) of broodstock collected can occur in Cedar Creek. In-season management decisions pertaining to collection goals by location and collection periods will be made by the H&S steelhead program coordinator in consultation with hatchery management staff.

Fish collected prior to February 1st may contain a higher proportion of individuals with genetic assignment to early winter hatchery stocks due to the advanced run/spawn timing of these stocks, and the likelihood that some hatchery fish successfully spawn naturally (B. Glaser, WDFW, memo to Erik Lesko, Jan. 29, 2009). Genetic analysis of fish captured prior to January 23 will provide valuable information pertaining to the proportion of natural NF Lewis River stocks prior to the collection window. Therefore, unmarked steelhead captured in either the Lewis River or Merwin traps between December 15 and January 23 will be PIT tagged and have a genetic sample taken before being released back to the river. Recaptures will continually be released unharmed from the traps during this period. After January 23, 2012, unmarked steelhead will be held at Merwin hatchery pending genetic results.

Progeny from broodstock spawned towards the end of the spawning period in late May through June may be difficult to rear to appropriate release size by May of the following year. Risks of releasing under-sized fish include decreased survival and a potential increase in residualism (pers. comm., C. Sharpe, WDFW), which may increase ecological interaction with other Endangered Species Act (ESA) listed salmonid populations (i.e. competition and predation). This risk should be balanced with the need to preserve the genetic diversity represented by late arriving or spawning fish. Adaptive management is needed to direct collections of broodstock from these early and late "tails" of the run as more information is gathered from this annual effort.

Table I-1. Cumulative broodstock collection guideline for each method to achieve cumulative collection goals during the collection window.

		CUMULATIVE BROODSTOCK COLLECTION TOTALS BY PERIOD			
PHASE	PERIOD	MERWIN/LRH TRAPS	LOWER RIVER COLLECTION	CEDAR CREEK* Weir/trap	TOTAL
1	Jan 23 - 31	1	0	0	**1**
	Feb 1 - 15	2	0	0	**2**
	Feb 16 -28	3	0	0	**3**
	Mar 1 - 15	4	2	1	**7**
	Mar 16 - 31	7	6	3	**16**
2	Apr 1-15	10	12	5	**27**
	Apr 16-30	16	18	8	**42**
	May 1-15	18	20	9	**47**
	May 16-31	20	20	10	**50**

*** Collection of steelhead at Cedar Creek is only as a last resort**

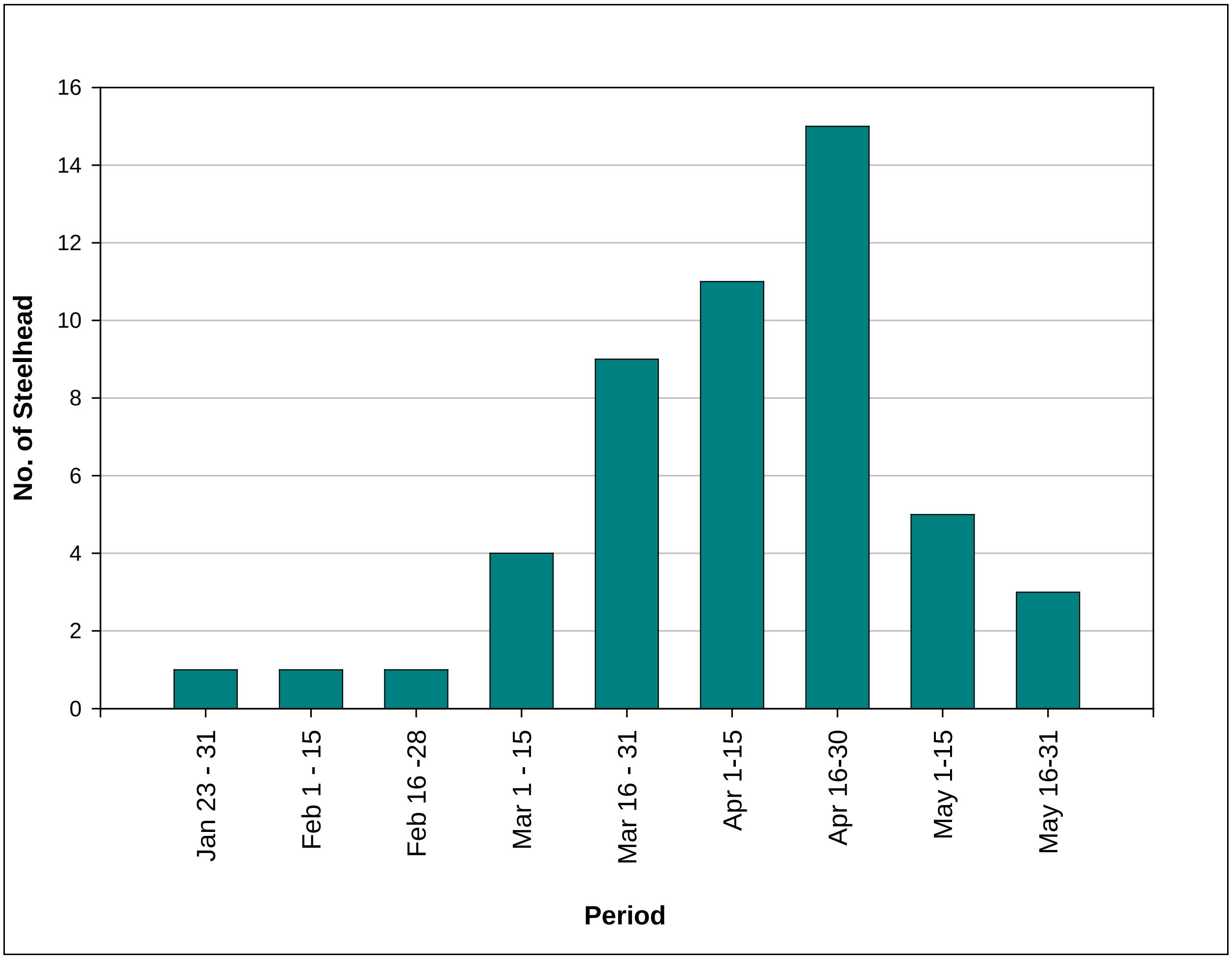

Figure I-1. Number of wild winter steelhead broodstock needed for each period during the collection window

2.6 PIT Tagging and Genetic Sampling Protocol

Unclipped steelhead brought into the hatchery facility from the Merwin Trap will be anesthetized using MS222 (or acceptable alternative) for DNA collection and Passive Integrated Transponder (PIT) Tag insertion into the dorsal sinus cavity. Unclipped steelhead collected from inriver netting and the Cedar Creek weir and trap may be sampled and tagged in the field prior to transportation to hatchery holding tanks. During genetic sampling and tagging, information will be collected from each fish to include:

1) Date of Sampling
2) Date of Capture
3) Location of Capture
4) Capture Method
5) Gender

6) Length
7) PIT tag code
8) Scanned for presence of snout blank wire tag
8) DNA sample number
9) Floy Tag Color and Number
10) Scale samples (3)
11) Other marks (i.e. mammal damage, net marks, etc.)
12) Notes and comments

Genetic sampling will consist of removal of a portion of the anal or caudal fin (round punch). The fin sample will be placed in genetic sample vials filled with ethanol. Genetic samples will be pooled and sent every Friday via express overnight mail to the NMFS genetics lab for assignment analysis. For each capture method, a distinct alphanumeric code will be assigned. Each location or method will have a distinct alpha code (e.g., TN = tangle netting) followed by sequential numbering. For steelhead transported upstream, a numeric code indicating the two digit year followed by sequential numbering will be used. By using one vial case for each location or method such as Merwin Trap, In-River capture, and Cedar Creek, mislabeling and miscommunication will be eliminated when sending and receiving genetic results. This should substantially eliminate any confusion for both the hatchery staff and genetics lab staff. In addition, identical data sheets will be used if more than one boat is used for in-river capture activities.

Field or hatchery staff will use injectors provided by the manufacturer to insert a PIT tag into the dorsal sinus cavity of each fish. Each injector and tag will be sterilized prior to insertion. PIT tag code verification will take place prior to insertion. After insertion, each fish will be interrogated with the reader to verify the code. The PIT tag will provide permanent identification of each fish until genetic testing results are provided and will allow for easy identification and assignment if the fish is subsequently released and later recaptured. Scales will be taken from each fish from the conventional sample location. Biological information on each fish will be linked with the corresponding PIT tag number and will be archived in spreadsheet format.

Floy® Tags (Floy Tag Mfg. Inc., Seattle WA) may also be used with PIT tags in the hatchery to provide an external visual marker for ease of fish identification. The purpose of the Floy tags will be to reduce handling stress during ripeness checks by hatchery staff.

2.7 Genetic Assignment Analysis

The HSS concluded that the most appropriate stock(s) for use in the steelhead reintroduction program are those endemic to the NF Lewis River basin. The Lower Columbia Fish Recovery Board's (LCFRB) Lower Columbia Salmon Recovery and Fish and Wildlife Subbasin Plan (LCFRB 2004) identifies the lower NF Lewis wild winter steelhead population (including Cedar Creek) as a unique population for recovery (rated as “contributing”) and recommends its use for reintroduction into the upper Lewis River basin.

The HSS also concluded that genetic screening of natural origin steelhead collected for broodstock should occur for three purposes:

1) To identify fish that may be derivatives of, or show influence from hatchery steelhead stocks propagated in Washington’s Lower Columbia River (LCR) hatcheries (i.e. Chamber’s Creek early winter steelhead & Skamania stock summer steelhead).
2) To identify fish with a high likelihood of origin from NF Lewis River and Cedar Creek stock(s) as compared to other LCR steelhead populations.
3) To ensure summer steelhead are not used as broodstock

For the purpose of establishing a broodstock for reintroduction upstream of Merwin Dam, the HSS has determined that each fish used for broodstock must show probability of assignment of 50 percent or greater to the NF Lewis River or Cedar Creek stock(s) combined. In the event that combined NF Lewis and Cedar Creek assignment is equal to primary assignment probability, the fish with the highest primary probability will have preference for broodstock retention. The only exception to this rule is for fish indicating assignment to hatchery stocks. Any winter steelhead with assignment to hatchery stocks at levels greater than 5 percent will not be incorporated into the broodstock despite genetic probability assignment of 50 percent or greater to the NF Lewis River wild winter steelhead stock.

For each broodstock collection period with excess fish, hatchery staff in consultation with the program coordinator and WDFW staff will select the appropriate number of males and females for release based on (weaker) genetic assignment probabilities. Collection goals for each location and period (Table I-1) will be used as guidance.

2.8 Genetic Assignment Analysis Procedures

A genetic approach will be used to determine if winter steelhead captured are indigenous NF Lewis River steelhead (i.e.,. a non hatchery fish from the NF Lewis River system). Each fish will be genotyped at NOAA’s NWFSC (Gary Winans) for 17 mSAT loci. Fifteen of these loci are “SPAN” loci for which standard binning protocol (Stephenson et al 2008) is used. Researchers will also include Ocl-1 and One-14 for use in on-going baseline study of resident rainbow trout prior to steelhead reintroduction (Winans et. al. 2008; Winans, unpublished data). Following laboratory work and final scoring procedures at NWFSC, researchers will employ a conditional likelihood function and partial Bayesian procedure (e.g., the program ONCOR, Steven Kalinowski, Montana State U.) to assign individual fish to a population in the baseline, using the 15 SPAN loci.

The baseline data used in this analysis consists of the following populations (number of collection years in parentheses): NF Lewis @ Merwin - natural (5), NF Lewis @ Cedar - natural (2), EF Lewis (2), Merwin Hatchery - summer (1), Grays River (2), Big Creek (1), Elochoman (3), Mill Creek (1), Germany Creek (1), Washougal (2), Cowlitz (1), NF Toutle (1), Green (1), SF Toutle (3), Coweeman (1), Kalama - winter (1), Kalama - spring (1), Kalama Falls Hatchery (1), Elochoman Hatchery (1), Clackamas (1), Sandy (1), Hood (1), lower N Santiam (1), upper S Santiam (1), Klickitat - summer (1), Skamania Hatchery - summer (1)

2.9 Broodstock Holding Protocols

The following list represents recommendations from WDFW hatchery staff that will be used to reduce handling related stress, injury or mortality of steelhead held at the Merwin hatchery. Other methods or procedures may be employed during the 2012 season. Additional methods other than those listed below will be provided to and agreed to by the HSS.

1) The use of only rubberized nets to hold or move steelhead: Rubberized nets are known to produce less descaling and abrasion.
2) Eliminating the use of cotton gloves to handle steelhead in favor of bare hands: Cotton gloves are abrasive on fish and remove the protective mucous on the skin of fish.
3) MS-222 or electronarcosis will be used to prevent injury and stress to fish while steelhead are handled (e.g., checked for ripeness, tagged or checked for PIT tags).
4) Floy tags may be used to visually identify acceptable broodstock. This should be done only if it helps in reducing the number of fish (and associated stress) that are handled on a weekly basis.
5) PIT tags will be inserted into all steelhead returned to river that have been sampled for genetic analysis. By doing so, any fish that are recaptured will easily be identified and will not be subjected to further genetic testing.
6) Salt will be used in holding raceways or circular tanks for steelhead. Salt reduces stress and improves oxygen uptake.
7) Ovarian Fluid: Ovarian fluid will no longer be drained prior to fertilization.
8) Eliminate green egg samples: Total egg mass weight will be used to estimate fecundity.

All natural origin winter steelhead broodstock will be held at the Merwin Hatchery. Steelhead will be held in separate existing adult raceways (e.g. ponds 2A, 2B or 2C) or circular tanks (if available) depending on capture site, until genetic assignments are complete. Hatchery staff will check broodstock weekly for maturity. Once DNA results are confirmed, hatchery staff will follow one of the following steps.

1) Natural origin winter steelhead identified for use as broodstock from the Merwin Trap, Cedar Creek weir or Lower River will be placed in adult pond 3 or circular tank.
2) Within each collection period, genetically eligible fish in excess of broodstock needs can be held in separate ponds for one additional period to ensure collection goals of the next period are met (see Release Protocols below).
3) Fish collected at Merwin Trap and Lower River that will not be used for broodstock (and do not meet No. 5 below) will be returned to the river at Island Boat Ramp.

4) Fish collected at Cedar Creek weir not used for broodstock will be returned and released into Cedar Creek upstream of the weir.
5) Unclipped steelhead that assign to a hatchery stock (≥ 50%) will be removed and not released back into the river.

2.10 Broodstock Release Protocols

Once the cumulative broodstock collection goal for female and males with sufficient genetic assignment is met for a collection period (Table I-1), excess fish up to the number needed for the next period should be held until collection goals for the following period are met. Surplus fish in excess of this need will be released based on confirmed genetic assignment probabilities. If cumulative goals are met with newly arriving fish, all excess fish held from the previous period will be released after assignment is confirmed for the newly arriving fish.

If a female becomes ripe and ready to spawn and no male broodstock are available or the fish is being held as excess and has not yet been incorporated into broodstock that fish will be returned to the river unharmed; however, all possible precautions will be made to prevent this situation from occurring. Decisions regarding release of fish will be made by the H&S steelhead program coordinator in consultation with hatchery management staff and the H&S subgroup. If a female is deemed to be nearing full maturation and no male broodstock are available, collection goals should be reviewed to evaluate the risk to project goals of releasing the fish (i.e. will more females likely be available through future collections).

2.11 Egg take goals

The egg take goal for this program is 80,000 +/- 20%. In-season adaptive management will be used to meet the egg take collection goals through broodstock management. No partial spawning shall occur for females. The last available spawning day will be approximately June 1, 2012 in order to meet the program size goals at release. If the rearing goal is exceeded (over 60,000 fish) by October 1, surplus fish will be released into Swift reservoir.

2.12 Spawning Protocols

All collected fully mature broodstock will be spawned according to the following protocols, without regard to age, size or other physical characteristics. No fish shall be excluded except for those with overt disease symptoms or physical injuries that may compromise gamete fertility or viability. All females will be air spawned to allow for kelt reconditioning.

1) Use fully randomized mating protocols to avoid or reduce selection biases.
2) Utilization of all adults in 2x2 factorial cross breeding is preferred whenever possible to maximize genetic combinations.
3) In the event that only one male and one female steelhead are available, a 1x1 cross can occur, but is not preferred.

4) In the event that two females and only one male fish are ripe (or vice versa), a 2x1 cross can occur, but is not preferred.
5) The use of males for a single spawning event is preferred; however, if there is a shortage of ripe males, males can be held for up to one additional period and used for a second spawning event. No male will be used for more than two spawning events.
6) In the event that a ripe spawning female has no mate, that fish will be returned to the river in hopes of spawning naturally (see section 3.1.6 -Release Protocols). All precautions will be taken to prevent this situation from occurring. Whenever possible the decision to release females should occur prior to the female becoming ripe.
7) The use of gonadatropin will be evaluated by the H&S steelhead program lead in consultation with the H&S subgroup.
8) During spawning, WDFW pathologist will take the necessary viral samples according to standard protocols.

2.13 Disposition Protocols

All male natural origin winter broodstock brought into the hatchery, with the exception of those identified in Section 2.9, will be kill spawned for pathogen testing. All females used for broodstock will be reconditioned as described in Section 2.22. Disposition of carcasses will be directed by the WDFW.

2.14 Disease Protocols

Male broodstock used for the supplementation program will be kill spawned. The goal of this practice is to determine the presence of Infectious Pancreatic Necrosis (IPN) and other pathogenic activity by obtaining kidney and spleen samples in each of the males. All female broodstock will be live spawned. Ovarian fluid will continue to be sampled for pathogens.

2.15 Egg Incubation

Incubation rearing will consist of dividing each egg tray in half and only having one female on one side of that tray. This will reduce the risk of Bacteria Coldwater Disease by reducing flow and mobility to the eggs. Each spawned fish will have its own ozonated water supply. Eggs or fish will not be combined until viral results are known. Fish or eggs testing positive for IPN will be destroyed.

2.16 Rearing and Release Program Schedule

Hatchery staff will begin feeding; monitor rearing densities and recording all data necessary for this stock. Eggs and juvenile fish will be raised in heated water as needed to speed development and assist in achieving a more uniform size. These fish will be raised in intermediate raceways on ozone treated water for 6-8 months or until they outgrow the rearing vessels. Once these fish outgrow the intermediate raceways they will be placed outside into standard raceways where they will be subject to untreated water. Standard protocols will be used in the case of a disease outbreak. Table I-2 presents a timeline for movement of fish by life history stage through the Merwin Hatchery.

Table I-2. Natural origin Winter Steelhead Hatchery Life History Timeline at Merwin Hatchery.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
Adult Collection	■	■	■	■	■							
Spawning			■	■	■							
Incubation			■	■	■	■	■					
Ponding IR inside						■	■	■				
Transfer/Rear RW outside	■	■	■					■	■	■	■	■
Tagged with blank wire												■
Transfer/Rear RP12			■	■	■					■	■	■
Volitional Release				■	■							
Flush Release					■							
Kelt Reconditioning			■	■	■	■	■					

IR = intermediated raceway
RW = raceway
RP = rearing pond

2.17 Feeding Type and Requirements

All fish that are ponded for rearing at Merwin Hatchery will be fed Bio Vita Starter and Bio Vita Fry throughout their lifecycle. These feeds provide some of the highest protein and fat percentages and have proven to be the best feed on the market for optimum growth from start to finish.

There will be a combination of feeding methods used to enhance growth. One option will be hand feeding 2-8 times per day depending on fish life stage. During their rearing in the troughs and intermediate raceways, belt feeders can potentially be employed for an extended feeding schedule. Once these fish are transferred to the raceways outside, only hand feedings will occur. When fish are transferred to the large rearing pond demand feeders will be used along with hand feedings 2-3 times per week if needed. More natural types of feeding (e.g., underwater or demand feeders) and rearing strategies will be explored and evaluated in the future.

2.18 Juvenile Tagging

Once these fish reach a size of 90 to 120 fish per pound they will be tagged in the snout with blank wire. At this point they will be placed in a large rearing pond until release at a target size of between 5 and 8 fish per pound.

2.19 Artificial Water Heating Methods

Heated water will be available through the use of a large commercial water heater and a hot tub water heating system. The hot tub water heating system will be used to heat the incubation supply water. The large commercial water heater will be used to heat the water supply to one intermediate raceway.

2.20 Target Release Size and Number

Target release size is 5 to 8 fish per pound. Some fish released may be smaller than the target depending on growth rates achieved while reared at the Merwin hatchery. The number released shall be 50,000 smolts +/- 20 percent. If releases are anticipated to be greater than the 20% buffer, the H&S steelhead program lead will notify the HSS to determine the appropriate disposition for the excess fish. An additional release of up to 3% of total production, not to exceed 1500 smolts, will occur in Cedar Creek if broodstock from this location were used.

2.21 Release Timing and Locations

Volitional release of fish is scheduled to begin on April 15th. Releases will continue through June 1st. A review of fish size (fish per pound) will be conducted prior to beginning volitional release.

Fish that actively migrate during the volitional release window will be trucked to the Merwin boat ramp (river mile 19) for planting. Once the volitional window has ended, the remaining fish will be hauled to the City of Woodland (approximate river mile 5) and planted at the county bridge crossing. Bio scanners (fish counter) and volumetric methods will be used to enumerate fish planted.

2.22 Kelt Reconditioning

All females will be live spawned (air spawned) and retained at the Merwin hatchery for reconditioning. Reconditioning will involve holding the females in covered circular tanks (when available) or holding raceways for approximately 3 to 5 weeks post spawning. Loading rates per circular tank will be as conservative as possible given the space available in the circular tanks and as determined by the Hatchery and Supplementation subgroup. Kelts will be fed a diet of par boiled dried krill at a rate of approximately 2.2 pounds of krill per kelt (total) throughout the holding period. All kelts will be treated with a one-time injection of oxytetracycline (antibiotic) and receive regular treatment of formalin or hydrogen peroxide to prevent fungal infection.

Release locations after reconditioning will be determined by the Hatchery and Supplementation subgroup, but will be downstream of popular fishing areas such as Cedar Creek and Island Boat Ramp (e.g., Pekins Ferry)

All females receive a PIT tag upon capture and a database will be updated to identify any kelts that are recaptured in future years. Verification of PIT tag retention will be made prior to release. In addition to PIT tags, the condition of each fish released will be rated and recorded. Ratings will follow the Yakama Nation screening criteria which select “good” – lack of any wounds or descaling and “fair” – lack of any major wounds or descaling. Weight measurements and photographs for both pre and post reconditioning may also occur at the discretion of the hatchery and supplementation subgroup.

SECTION II. SPRING CHINOOK

1.0 Introduction

Spring Chinook reintroduction will utilize two life history approaches to reintroduce spring Chinook into their historical range and habitats. First, hatchery adults (up to 2,000) will be transported to the upper basin each year to spawn naturally. Second, a juvenile supplementation program will be initiated that will rear young of the year spring Chinook in the hatcheries for a little over 1 year. These juveniles will then be transported to the upper basin and placed temporarily into acclimation ponds. These yearlings will acclimate to the upper basin during this time and then be released to migrate naturally to the Swift collector. Returns from adult and juvenile supplementation will be used for broodstock for the juvenile supplementation program and for transportation of adults to the upper basin with the goal of building a self sustaining population that does not require hatchery support.

2.0 Program Implementation

The following sections describe the detailed protocols for implementation of the Spring Chinook portion of the H&S Plan.

2.1 Broodstock Collection

The collection of natural adult spring Chinook will serve three primary objectives: (1) to provide broodstock for the production of juvenile Chinook for acclimation sites upstream of Swift dam, (2) to be released upstream of Swift dam to spawn naturally, and (3) to provide broodstock for maintaining current hatchery production obligations at the hatchery facilities.

2.1.1 Broodstock Collection Goal

- Juvenile Supplementation: Up to 65 over full range of the run.
- Adult Supplementation: Up to 2,000 over the full range of the run.
- Hatchery Broodstock: Up to 1,000 over the full range of the run.

Table II-1. Number of Spring Chinook Trapped at the Lewis River Hatchery and Merwin trap between 1998 and 2010.

YEAR	ADULTS	JACKS	TOTAL
1998	1,188	11	1,199
1999	846	78	924
2000	777	50	827
2001	1,178	53	1,231
2002	1,869	58	1,927
2003	3,037	357	3,394
2004	4,172	350	4,522
2005	1,986	219	2,205
2006	2,053	217	2,270
2007	4,134	9	4,143
2008	1,384	49	1,433
2009	1,044	407	1,451
2010	1,744	23	1,797

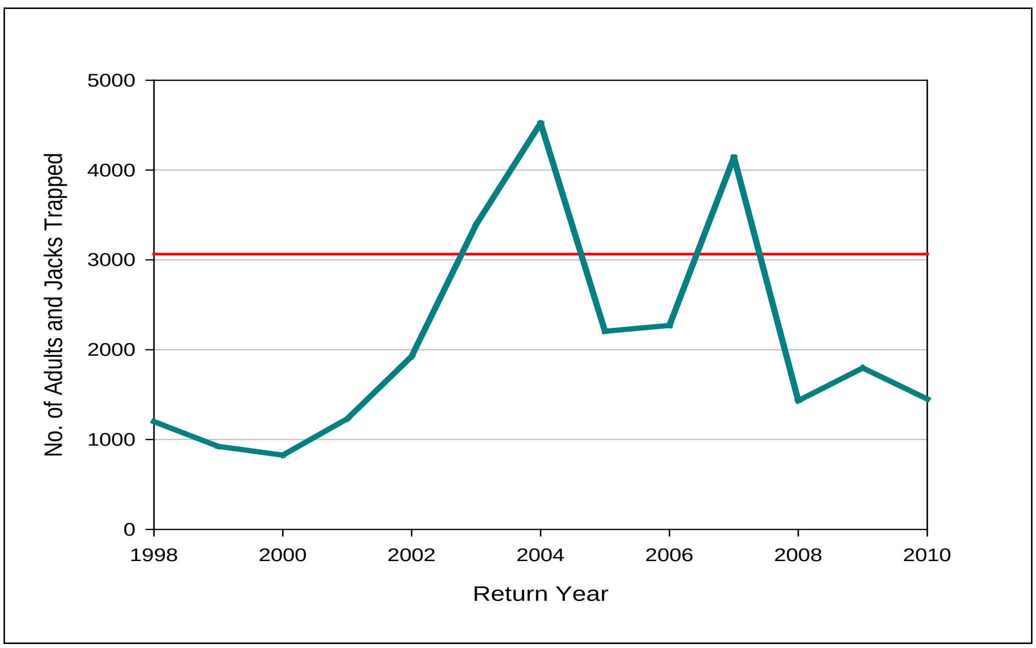

Figure II-1. Annual trapping totals (1998 – 2010) for spring Chinook at the Merwin and Lewis River traps (including jacks) and the broodstock collection goal (red constant line) of 3,065.

2.1.2 Broodstock and Supplementation Source

Unclipped Chinook captured without a wire tag (naturally produced) will be used first to meet broodstock needs for the juvenile supplementation program. Once this program needs have been met (65) and surplus unclipped Chinook are captured they will be transported upstream to meet the adult supplementation needs beginning in year 2012 (up to 2000). Hatchery spring Chinook may be used to supplement broodstock needs for both of these two programs. Hatchery programs will continue to rely on hatchery returns to meet broodstock needs. In years when hatchery returns are weak, it may not be possible to meet the transportation goal of 2,000 Chinook.

2.1.3 Collection Locations

All adults will be collected at either the Merwin or Lewis River collection facilities. All fish will be sorted at these facilities and be used according to priority assignment described in Section 2.1.2. Procedures for both facilities involve clearing the trap on a daily basis.

2.1.4 Collection Timing

Broodstock collection for the juvenile supplementation program should occur proportionately over the entire run timing. Natural origin Chinook that are not used for juvenile supplementation should be transported to the upper basin at the time of capture. Figure II-2 illustrates the capture timing of spring Chinook at the Merwin trap.

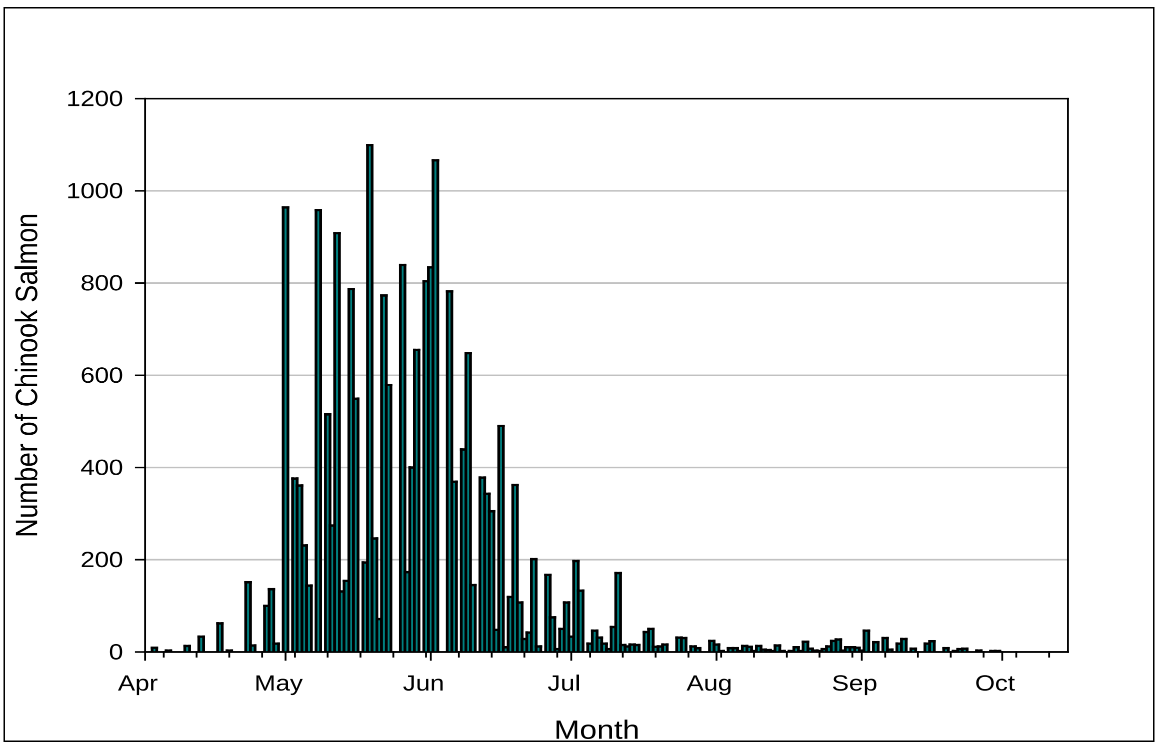

Figure II-2. Illustration of weekly trap capture (timing) for spring Chinook at the base of Merwin dam (Merwin trap) during the period 2003 through 2009.

2.2 Transportation Schedule

Up to 2000 spring Chinook (when available) will be transported from the Merwin and Lewis River traps to Swift reservoir beginning in 2012. It is preferable to have these be from natural origin. However, given the collection number provided in Table II-1, this is not always possible (even with 100 percent hatchery origin Chinook). A minimum of two tanker fish trucks will be used on a weekly basis to move captured spring Chinook upstream. Each tanker truck can transport up to 100 adult Chinook salmon.

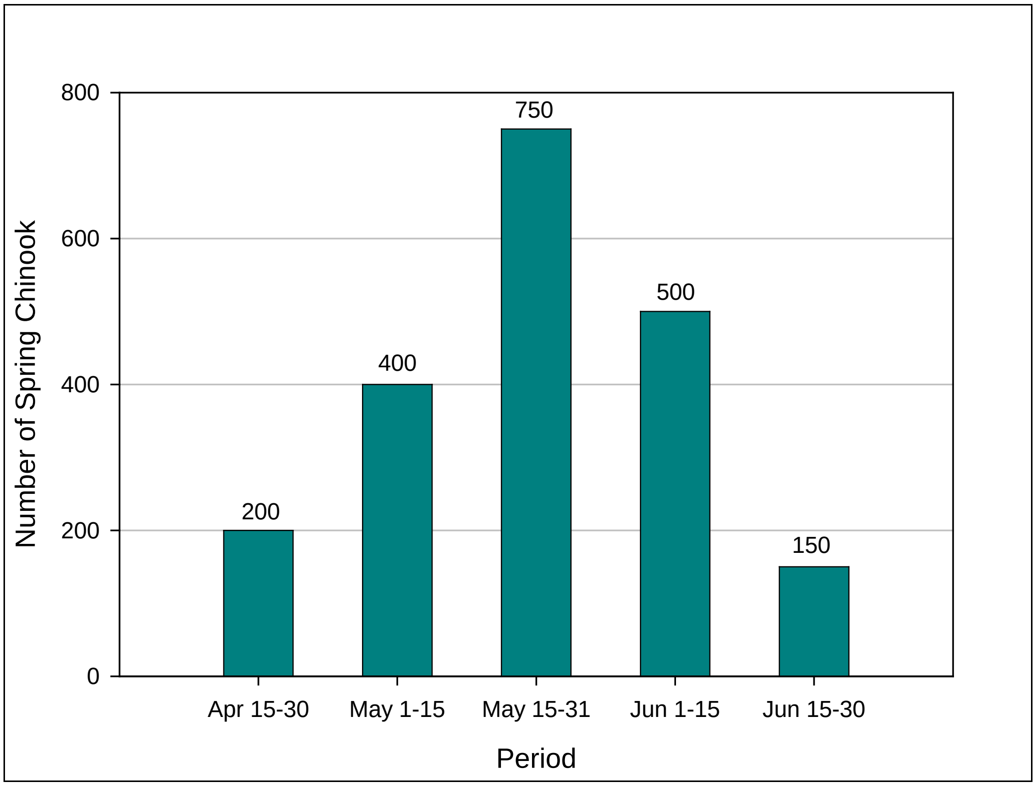

Figure II-3. Number of spring Chinook (n=2000) to be transported from the lower river traps and transported upstream of Swift reservoir (on biweekly basis). (values based on actual Merwin trap data between 2003 and 2009).

2.3 Holding and Release Protocols:

Broodstock are collected daily from late April through June at Merwin FCF and transported to Speelyai Hatchery. Fish will hold there until spawning occurs in mid-August. No broodstock fish are released, used for nutrient enhancement or donated to any food banks or tribes because of withdrawal period of injections.

2.4 Egg take goals

Hatchery Production: 1,600,000 eggs (to produce 1,250,000 smolts)

Acclimation Fish: 130,000 (to produce 100,000 smolts)

2.5 Spawning Protocols

All Spring Chinook are spawned with a one to one ratio and a backup male is used.

2.6 Disposition Protocols

Because all fish are kill spawned only carcasses will be available and disposition of these will be directed by the WDFW. All Spring Chinook transported to Speelyai Hatchery for broodstock have been injected with Galimycin which has no withdrawal period therefore carcasses will be sent to landfill.

2.7 Disease Protocols

All females spawned will be ELISA sampled for Bacteria Kidney Disease. Once sample results are found each female is assigned a level of BKD.

2.8 Egg Incubation and Juvenile Rearing

2.8.1 Incubation

Eggs are incubated in vertical heath trays. Each female is assigned a number and only one female per tray unless there is not enough trays towards the last egg take then two or three fish will be pooled together until results are in from the ELISA testing. Once results are in staff will only combine females with the same level of results together for hatching. If determined on the last egg take that there are a surplus of eggs then staff could have the option to cull any eggs with low, moderate or high levels of BKD with confirmation from pathology.

2.8.2 Pathology Screening

A pathologist takes all kidney, spleen, and ovarian samples used to determine the ELISA results for BKD. Adult fish (>60 females) are to be inspected and sampled for reportable pathogens during spawning. The reportable pathogens, as defined in USFWS policy 713 FW, are infectious hematopoietic necrosis virus (IHNV), infectious pancreatic necrosis virus (IPNV), viral hemorrhagic septicemia virus (VHSV), infectious salmon anemia virus, *Oncorhynchus masou* virus, *Renibacterium salmoninarum* (causative bacteria of BKD), *Aeromonas salmonicida*, *Yersinia ruckeri*, and, if needed, *Myxobolus cerebralis*.

2.9 Program Schedule

Table II-2. Hatchery production and collection timeline for North Fork Lewis River Spring Chinook

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Adult Collection & Transport												
Spawning												
Incubation and Rearing												
Transfer to Acclimation Ponds												
Hatchery Release												
Acclimation Release												

2.10 Feeding Type and Requirements

All Spring Chinook from fry to smolt are fed Bio-Vita diet. Fry will start out being fed seven days per week and as they grow the days of week will be reduced not going less than three days per week.

2.11 Juvenile Tagging

Juvenile tagging type and location for spring Chinook are presented in Table 4-1 of the Hatchery and Supplementation Plan (PacifiCorp 2009).

2.11.1 Hatchery Supplementation (1,250,000)

Total production of juveniles is 1,250,000. Most smolts (950,000) will be adipose clipped only. An additional 150,000 will be adipose clipped and coded wire tagged in the snout. The remaining 150,000 will be coded wire tagged (snout) with no adipose clip (double-index group).

2.11.2 Acclimation Fish (100,000)

Ten percent of fish will be PIT tagged in 2013 prior to release in acclimation sites.

2.12 Target Release Size and Number

Target release size is 8 to 12 fish per pound for hatchery reared fish released into the North Fork Lewis River downstream of Merwin Dam. Some fish released may be smaller (or larger) than the target depending on growth rates achieved while reared at the hatchery. Total smolt production will be set at 1.35 million. Of this total, 100,000 young of the year Chinook will be used in upper river acclimation sites beginning in early 2013. Target release size for acclimation fish is 8 to 12 fish per pound.

2.13 Release Timing and Locations

Volitional release of hatchery reared Chinook is scheduled to begin as early as February. All hatchery reared juveniles will be forced released from the Lewis River Hatchery by early March. Acclimation site Chinook will also be volitionally released, however, it is expected that volitional period will vary depending on weather and snow conditions. Volitional release of acclimation site fish should begin no later than April 1 or as determined by the HSS. A determination of average fish size (fish per pound) will be conducted prior to the start of volitional releases.

SECTION III. COHO SALMON

1.0 Introduction

This program will rely exclusively on transporting adults to the upper watershed (upstream of Swift). Transported adults will be able to spawn naturally using all available habitats. Progeny from these transported adults will be collected at the Swift floating surface collector and transported downstream of Merwin dam to begin their migration to the sea. The program targets up to 9,000 adult coho to be transported over the duration of the run timing. This value was selected through the Ecosystem Diagnostic and Treatment (EDT) process to define the spawning capacity in the upper watershed. Transportation of adults will begin in the fall of 2012.

2.0 Program Implementation

The following section describes the protocols for implementing the coho program of the H&S Plan.

2.1 Broodstock Collection

All coho (early, type S) used for broodstock and transportation will be collected from the Lewis River ladder and Merwin Traps. Broodstock collection and transportation fish will be collected over their entire run timing.

2.1.1 Broodstock Collection Goal

- Adult Supplementation: Up to 9,000 early coho will be collected and transported to the upstream end of Swift reservoir
- Hatchery Broodstock: Up to 1,000 adults will be used as broodstock to support the hatchery production goal of 950,000 smolts (released annually).

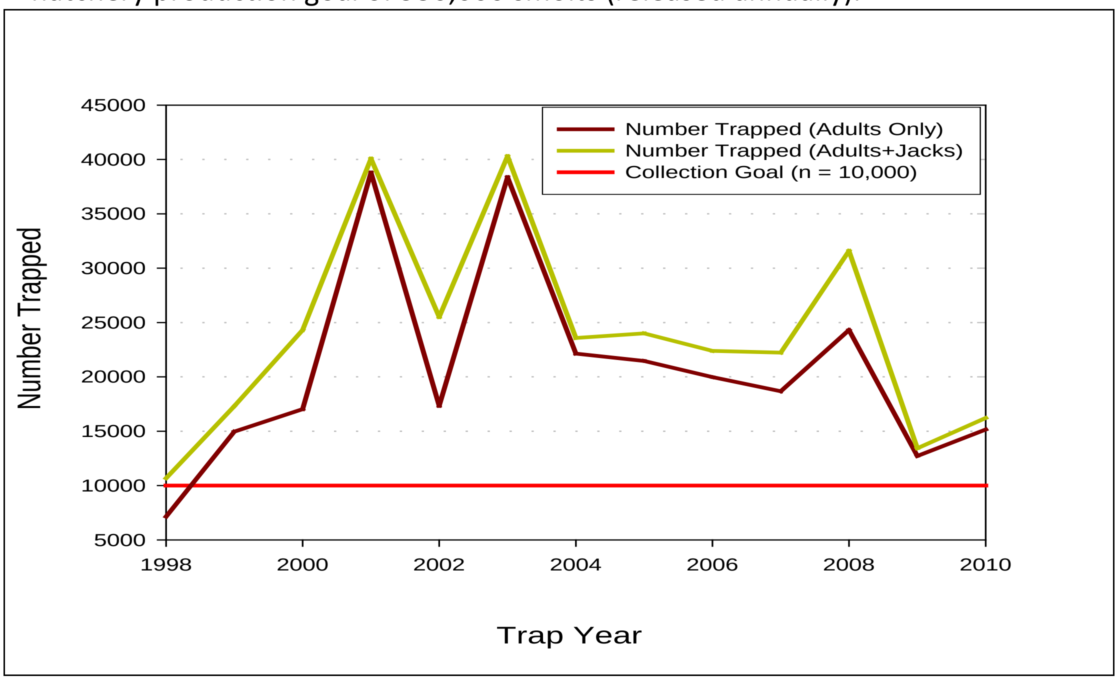

Figure III-1. Total number of early coho capture annually between 1998 and 2010 ***(Reference collection goal line represents number of early coho needed each year to meet hatchery broodstock targets and adult supplementation goals upstream of Swift reservoir).***

2.1.2 Broodstock Source

The fish source for this program shall be composed exclusively of early coho returning to traps on the North Fork Lewis River. Historically, the overwhelming majority of early coho returning have been of hatchery origin. Any naturally produced (unclipped and untagged) fish will be used as part of reintroduction efforts.

2.1.3 Collection Locations

There are two locations that will be used to collect both broodstock and reintroduction fish: these include the Merwin trap at the base of Merwin dam (RM 19) and the Lewis River ladder located at the Lewis River hatchery (RM 15)

2.1.4 Collection Timing

Figure III-2 provides average trap counts per week for the period 2003 to 2009. These represent the cumulative weekly counts for each week during the period.

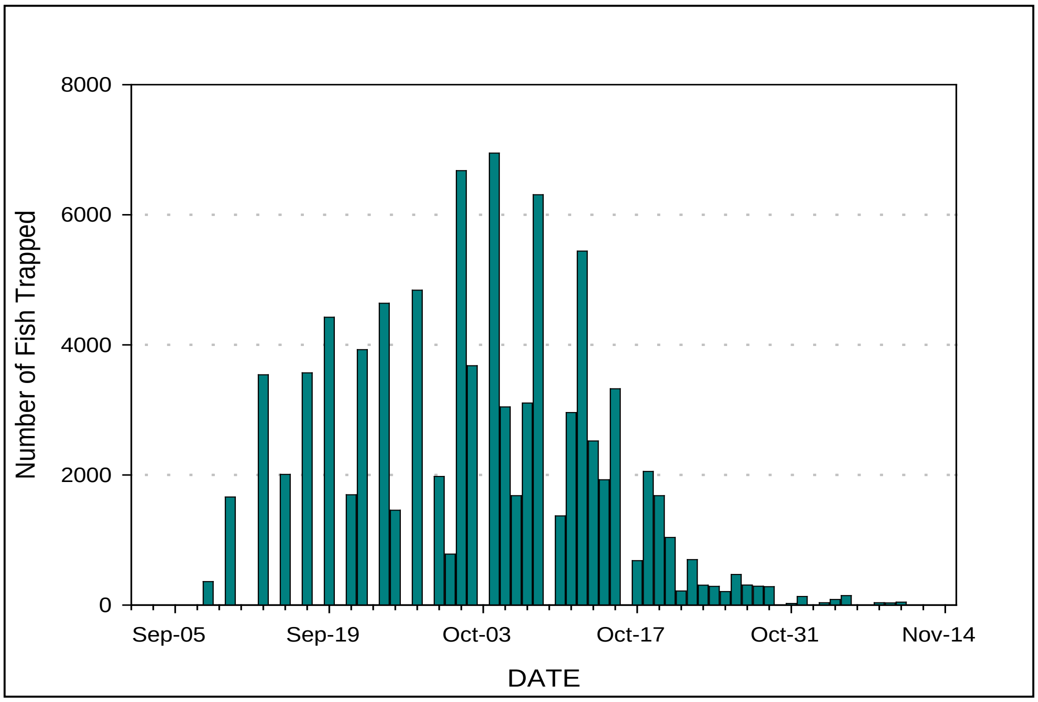

Figure III-2. Trap capture timing for early coho at the base of Merwin dam between 2003 and 2009.

2.2 Transportation Schedule

The Hatchery and Supplementation Plan identifies early coho as the reintroduction species (as opposed to late coho). In addition, it is important that transportation of adult coho occur throughout the run period. Therefore, care should be taken to begin transportation activities as soon as practical and have a predetermined end date. Once these dates are chosen, a schedule should be set to ensure that fish are transported throughout the trapping period and be similar to that provided in Figure III-2. Figure III-3 provides a proposed transportation schedule indicating weekly numbers to achieve the transport goal of 9,000.

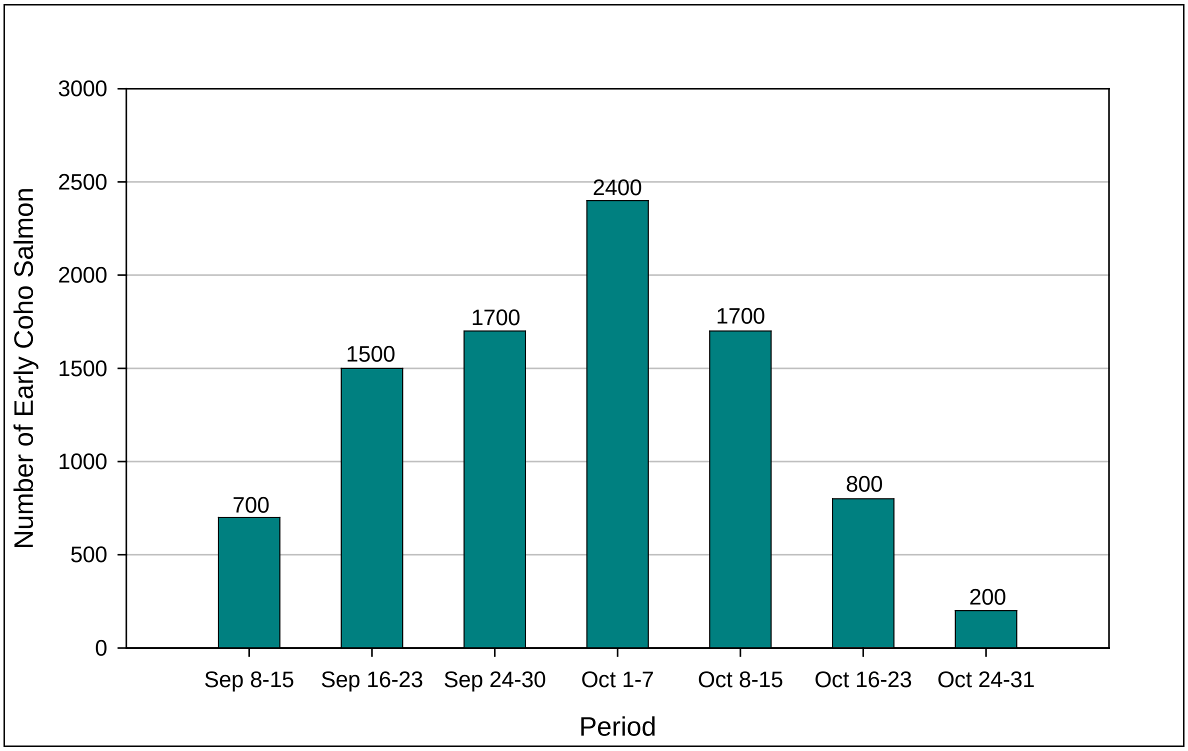

Figure III-3: Proposed transport time and number for early coho from the Lewis River downstream of Merwin dam upstream to Swift reservoir. (based on trapping results between 2003 and 2009 at the Merwin trap)

2.3 Holding Protocols

Broodstock are collected weekly at Lewis River Sorting Facility from late September – mid October and transported to Speelyai Hatchery. Fish will hold there until spawning occurs in October. All broodstock fish are used for nutrient enhancement with the exception of mortalities.

2.4 Release Protocols

Coho are volitionally released starting in April and then flushed out in May. Fish are released at 16 fish per pound.

2.5 Program Schedule

Table III-1. Hatchery production and collection timeline for North Fork Lewis River early coho salmon

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Adult Collection & Transport												
Spawning (Natural)												
Incubation and Rearing (Natural)												
Juvenile Collection and Transport Downstream												

SECTION IV. MONITORING AND EVALUATION

The monitoring and evaluation procedures for adult spring Chinook and coho are identical as both species share similar life history characteristics. To reduce redundancy in this plan both species are treated together in this Section. Late winter steelhead monitoring methods are treated individually in this Section as the methods to monitor and evaluate this species differs due to differences in life history characteristics and behaviors (e.g., iteroparity).

1.0 Monitoring Methods and Objectives

Monitoring objectives for all introduction species are derived from Section 4.3.4 of the Hatchery and Supplementation Plan and are provided as follows.

1. Determine adult composition (hatchery vs. wild) on spawning grounds downstream of Merwin dam
2. Determine spatial and temporal distribution of spawning fish
3. Estimate adult abundance downstream of Merwin dam
4. Estimate juvenile abundance (reproductive success) downstream of Merwin dam
5. Estimate juvenile migration and residualism of hatchery releases downstream of Merwin dam
6. Hatchery juvenile monitoring for ecological interactions with wild smolts

Several methods will be employed to meet these objectives including the potential use of screw traps, seining, carcass tagging and surveys, redd surveys, and live counts. Survey areas will predominately be focused on the mainstem except for adult coho monitoring which will also incorporate tributary streams. Also, existing monitoring efforts on Cedar Creek by the WDFW will be included as part of the overall monitoring effort.

The objectives outlined in the HS plan are common to many river systems and the HS subgroup will need to follow the success (or failure) of these programs to continually improve monitoring programs implemented within the Lewis River system. It is expected that monitoring procedures will change often, perhaps annually. Thus, methods described below are intended to be reviewed annually and if necessary modified based on previous results and to conform to monitoring efforts conducted in other regional basins.

2.0 WINTER STEELHEAD

2.1 Adult Monitoring and Evaluation Activities

Adult monitoring activities will focus on evaluating adult abundance and spatial and temporal distribution through redd surveys. Composition of hatchery versus wild will rely on in-river broodstock captures through tangle netting and trap captures as described in Section I (2.3) and subsequent genetic assignment analysis.

2.1.1 Redd Surveys and Live Counts

Redd surveys and live counts will be conducted by boat and used to estimate abundance, and spatial and temporal distribution of adults. On each survey, the locations of newly identified redds will be recorded (latitudinal and longitudinal coordinates) using recreational grade units. GPS units will be allowed to acquire satellite locations until an accuracy of 100 feet or less is obtained, most often accuracies average 5 to 50 feet. Each redd will be assigned a unique sequential code. The date and notes describing the location of each new redd in relation to other redds and other prominent landmarks will be recorded. Winter steelhead redds will be marked with high-visibility flagging and 1 pound pyramid weights or appropriate alternative (e.g., railroad spikes, washers). The flagging will reduce error associated with double counting. In subsequent surveys, previously located redds will be inspected to determine if they should be classified as "still visible" or "not visible". A redd is classified as "still visible" if it would have been observed and identified as "new" without the use of GPS, notes and flagging, and is recorded as "not visible" if it does not meet this criterion. All surveyors will be proficient in redd identification. A tally of all live fish identified to species will be made for each survey date. Redd counts will be summarized by Section using the same delineations as described by WDFW fall Chinook survey crews. All GPS points will be provided to PacifiCorp staff and a map indicating all redd locations will be provided in each annual report similar to Figure IV-1.

2.1.1.1 Frequency and Timing - When river conditions are favorable, redd surveys will be conducted every 7 to 10 days by a two-person boat crew for the mainstem. Favorable conditions are defined as visibility of more than 3 feet and mainstem river flows without spill. Winter steelhead redd surveys will begin during the week of April 1 and be conducted at least once every 10 days through June 30.

2.1.1.2 Survey Reach - Merwin Dam (RM 19.4) downstream to the County Bridge in Woodland Washington (RM 5.6).

Using methodology developed by WDFW, the season total count of new redds will be converted to the number of spawners. To estimate in-river escapement, the number of redds is multiplied by a 0.81 multiplier (Freymond and Foley 1986).

These calculations yield an estimate of the number of females for each species, which is then multiplied by two to provide a total escapement; based on the assumed average sex ratio of 1:1 (Freymond and Foley 1986).

Under ideal conditions, surveys conducted regularly (every 7 to 10 days) throughout the season are assumed to provide a census count of all redds constructed. By marking redd locations via GPS, flagging and detailed notes, double counting of redds is minimized and a total count of unique redds can be developed. Conversion of this count to fish numbers as described above yields an estimate of abundance. Escapement estimates will be reported in PacifiCorp's annual operating report. It is important to note that abundance estimates do not include wild winter steelhead captured and retained for broodstock at the hatchery.

Ideal surveying conditions throughout the entire spawning period for each species is not likely, and periods of poor survey conditions greater than 14 consecutive days may occur. Under this scenario, counts of uniquely identified redds converted to fish numbers can still provide an estimate of the minimum spawner escapement. In addition, Area Under the Curve (AUC) methods can sometimes be used to estimate total redd numbers from incomplete survey data. If applicable, AUC will be used to estimate total numbers of redds for spawner escapement development.

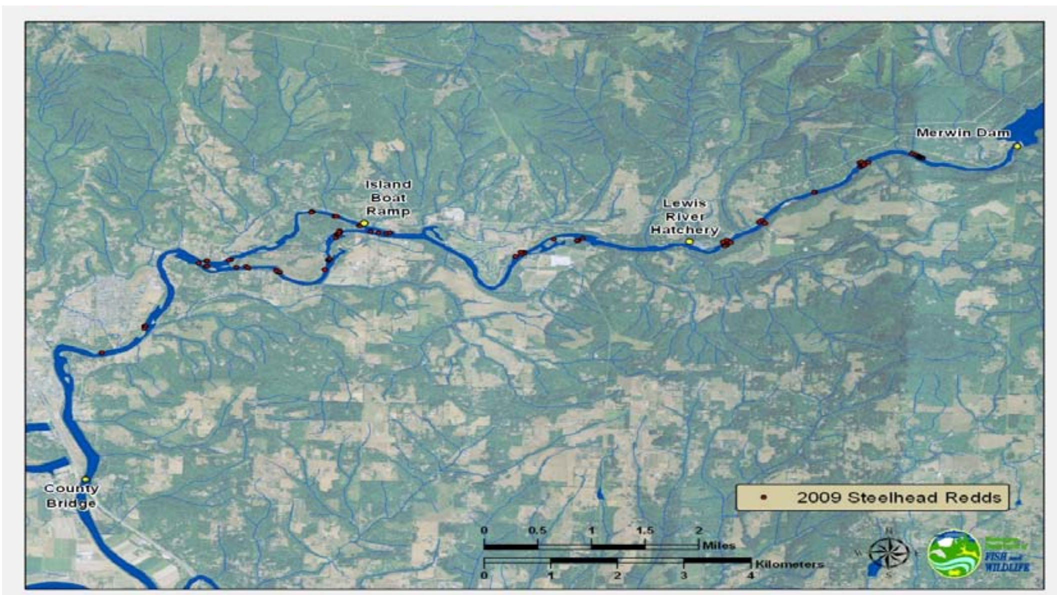

Figure IV-1. Example of data collected during 2009 winter steelhead redd surveys on the N.F. Lewis River indicating redd counts and survey area. (Redd locations identified are from 2009 survey days only and do not represent a total count of redds for the 2009 season.)

2.1.2 Assessment of Program Adult Returns to the Merwin Trap

Once adults begin to return from yearling winter steelhead hatchery releases, an assessment of the proportion returning to the Merwin Dam fish collector needs to occur. This assessment may provide information valuable for two reasons: First, it provides an indication of program fish fidelity to the Merwin trap, which in essence is a measure of collection efficiency, and secondly, it provides a measure of the proportion of hatchery origin fish (releases from the wild winter steelhead program) that stay in the river and presumably spawn naturally, often termed PHOS. This information is beneficial for assessing the effects to the lower river natural origin spawning population and evaluating program performance. The information is also helpful in directing adaptive management decisions.

This assessment will be accomplished by tagging program fish through in-river tangle netting efforts over the course of the return. Program returns will be identified by wanding them for the presence of a blank wire tag in their snouts. Blank wire positive steelhead indicate program origin fish. Program return fish will be tagged with a PIT tag into the dorsal fin area and the fish will be released. Routine data indicating length, gender, condition, location of capture and tag code will be documented. The number of fish recaptured at the Merwin trap will be recorded, providing a simple measure of collection efficiency (number of fish recaptured divided by the number of fish tagged). Mark-Recapture methodology (i.e. Petersen estimate) could provide an estimate of the total program return. Through subtraction, the number of fish remaining in the lower Lewis River could be calculated (total estimated program return minus the actual number captured at Merwin). Combined with estimates of total spawner abundance via redd surveys, PHOS can be calculated (estimated number of program fish remaining in lower river divided by the total estimated spawner abundance). In addition, by estimating the total return of program fish to the Lewis River, estimates of smolt-adult survival for program releases can be calculated.

2.2 Juvenile Monitoring and Evaluation Activities

Monitoring of juveniles requires methods to collect and sample individual fish. There are currently only two methods known to collect outmigrating smolts: seining and trapping. Trappng is currently being evaluated for all species, but is not expected to be implemented in 2012. For 2012, intensive beach seining similar to 2011 will be used. In 2011, work crews were able to identify a number of usable seining sites and also determine river conditions that were effective. It is anticipated that additional sites will be identified in 2012 that will allow a more robust collection area to be determined.

2.2.1 Seining

Seining multiple areas downstream of Merwin dam will allow the capture and sampling of smolts in a variety of habitats and provide the means to sample smolts that are spatially separated. Biological sampling these smolts in different (both spatially and by habitat type) areas may provide information related to ecological interactions between hatchery and wild smolts such as predation through lavaging, size difference and relative abundance. Seining conducted in 2011 was sometimes ineffective due to higher than normal flows downstream of Merwin dam. Based on experience learned in 2011, seining will only be conducted when flows (measured at the Ariel gage) are equal to or less than 4000 cfs. Seining attempts are unaffected by turbidity.

Seining has been employed previously with good results (Hawkins and Tipping 1999). Hawkins and Tipping captured over 60,000 young of the year fish and over 3,700 smolts using seines during the period 1995-1997. Our intent is to use the same sites as Hawkins, but also expand to additional sites. Also, we will use longer seines (up to 130 feet long) in an attempt to improve catch rates of smolt sized fish for all three species. Using seining to meet objectives related to ecological interactions relies on two assumptions. First, that an adequate sample of sites are available to apply a spatially balanced or stratified sampling protocol and second, that collection efficiency of seining is adequate to capture a statistically valid number of smolts.

2.2.1.1 Frequency and Timing - April 1 – June 1. Seining will be conducted once per week assuming river levels are less than 4,000 cfs as measured at the Ariel Gage.

2.2.1.2 Survey Area - Sites will be identified between RM 16 (Colvin Creek) to the downstream end of Eagle Island (RM 9.4)

2.2.2 Biological Sampling

All fish captured for each seine haul and location will be enumerated and identified to species to quantify species composition and relative abundance. Also, the ratio of hatchery and wild smolts for each species will be recorded for each seine haul. This information will help determine whether wild and hatchery fish are occupying the same habitat during their residency time. Fork lengths of each smolt will be taken. All unclipped steelhead and all coho and Chinook smolts will be wanded to determine the presence of CWT or blank wire tags in the case of unclipped steelhead. A random subsample (if necessary) of 10 smolts of each species from each location will be lavaged to document predation for each species. If possible, the 10 smolts will be comprised equally of hatchery and wild smolts for each species. This subsample will also be observed for condition factors such as scale loss and k factors.

2.2.2.1 Gastric Lavaging - Samples of each species will be collected from each seining attempt for gastric lavage. Data will be recorded with respect to the presence of fish to determine predation rates for each species and for comparison between hatchery and wild origin smolts. Reporting methods will follow those of Hawkins and Tipping, 1999. Lavaging techniques will use either a wash down pump (boat) or portable lavager to force water through a trigger assembly and flexible tubing. The tubing will be sized appropriately for smolts and water flow will be controlled by the trigger assembly.

3.0 SPRING CHINOOK AND COHO SALMON

3.1 Redd Surveys and Live Counts

Redd surveys for spring Chinook and coho salmon will be used to determine spatial and temporal distribution of spawning. Live counts will be used in combination with carcass surveys to help develop escapement estimates of both Chinook and coho salmon.

3.1.1 Redd Surveys

All mainstem redd surveys will be performed by boat. Redd counts will be enumerated by section. On the peak redd construction day as determined by field crews for Chinook, early and late coho, all redds will be marked with a handheld GPS receiver. In instances where multiple redds are located within a defined area (e.g., tailout), the number of redds contained within this area can be counted as one GPS point. These clusters will be separated out as individual GPS points upon entering into a Geographic Information System (GIS). GPS locations and dates of new redds will be used as a measure of spatial and temporal distribution. GPS coordinates for each new redd will be entered into a GIS database or acceptable alternative software package which provides a useful tool for interpretation of this data.

This information will provide distribution data of spawning salmon downstream of Merwin Dam. Flagging will not be used for coho or spring Chinook redd counts.

3.1.2 Live Counts

Live counts will be done concurrently with redd surveys. Fish surveyors will have the ability to consistently and accurately identify different salmonid species visually from the bow of the boat while recording redds. Live counts will be delineated by Section number.

3.1.3 Frequency and Timing

Redd surveys and live counts will be conducted every 7 to 10 days by a two-person boat crew for the mainstem (one boat for spring Chinook) and two person foot crews for tributary surveys. Favorable conditions will be defined as visibility of at least 3 feet (2 feet for tributaries) and mainstem river without spill (for mainstem surveys). Under no circumstances will surveys be conducted during periods of spill at Merwin dam for safety reasons. Redd surveys for both spring Chinook and coho may be conducted on the same day each week and may occur during the drawdown days scheduled for fall Chinook surveys.

3.1.3.1 Spring Chinook - August 15 – October 15 (at least once every 10 days)
3.1.3.2 Coho Salmon - October 1 to January 30 (at least once every 10 days)

3.1.4 Survey Reaches

3.1.4.1 Coho Salmon - Merwin Dam (RM 19.4) to downstream end of Eagle Island (RM 9.4). Including tributaries identified by the HSS.

3.1.4.2 Spring Chinook - Merwin Dam (RM 19.4) to downstream end of Eagle Island (RM 9.4).

3.1.5 Data Analysis

Redd counts and locations will be entered into GIS database and provided in PacifiCorp's annual operating plan annually.

3.2 Carcass Surveys

Carcass surveys will be used to determine origin (hatchery vs. wild), abundance and for CWT or other tag recoveries of both early and late coho salmon. For carcasses recovered in acceptable condition, a genetic punch shall be taken for potential genetic marker protocol methodology that may be implemented in 2013.

3.2.1 Frequency and Timing

3.2.1.1 Spring Chinook August 15 – October 30
3.2.1.2 Coho Salmon October 15 – January 31

Drawdowns will only occur for a maximum of one day per week during the fall Chinook surveys (Wednesdays). Coho carcass surveys will be conducted on Thursday and Friday (if necessary). Spring Chinook redd and live count surveys can be conducted on any day of the week, but should be done on proposed drawdown days for fall Chinook sampling.

Table IV-1: Proposed survey days for coho salmon surveys in combination with ongoing fall Chinook monitoring downstream of Merwin dam

ACTIVITY	DAY
Coho redd survey	Tuesday
Spring Chinook Redd Survey	Wednesday (Fall Chinook drawdown day)
Coho carcass survey	Thursday
Coho carcass survey	Friday (if necessary)

3.2.2 Survey Reaches

Survey reaches will extend from the Merwin Dam downstream to the downstream end of Eagle Island including identified tributaries for coho surveys.

3.2.3 Tributary Surveys for Coho

Generalized random tessellation stratified (GRTS) methodology will be used to develop a spatially balanced sampling area for coho surveys of tributary streams. Sample framework for 2012 coho tributary sampling will be developed by WDFW and approved by the HSS prior to implementation in the fall of 2012.

The main Lewis River tributary (excluding the EF Lewis) supporting coho production is Cedar Creek. WDFW already has a well developed monitoring program for Cedar Creek, and this monitoring should continue as part of WDFW's lower Lewis monitoring program. In 2010, WDFW implemented a mark-recapture study design using the Cedar Creek fish ladder and weir, in combination with concurrent stream surveys to develop estimates of apparent residence time needed for Area-Under-the-Curve (AUC), and adults or females per redd estimates for redd based surveys.

Outside of Cedar Creek, implementation of a spatially balanced sampling design, such as Generalized Random Tessellation Stratified (GRTS) sampling, is recommended. Typically with this type of design is that at least 30% of the distribution should be sampled to develop unbiased estimates (Dan Rawding WDFW, pers com). WDFW has developed a predictive coho distribution model that can be applied to lower Lewis river tributaries using GIS to determine the sampling frame. This model predicts the extent of coho distribution within a tributary based upon its drainage area and gradient, minus any barriers. After initial application of the model, any known coho barriers can be applied to truncate those reaches. After the sampling frame is established, reaches for the GRTS design can be developed.

Application of the distribution model to establish the sampling frame and development of GRTS reaches has not been done for lower Lewis River tributaries. This will need to be completed before an assessment of the number of actual survey reaches needed for unbiased and precise estimates, and the staffing levels needed to survey them, can be made.

Once GRTS survey reaches are determined, each reach should be walked at least every 10 days, or as conditions allow, from October 1st to January 31st. On each survey, counts should be made for: live adult coho (classified as holders or spawners), coho redds, and dead coho carcasses. Carcasses should be sampled for fork length, sex, the presence/absence of an adipose fin to determine wild/hatchery origin, and wanded for CWT presence. CWT positive fish should have their snouts taken for CWT recovery. Additionally, up to 150 natural origin coho (adipose intact, wand negative) should be scale sampled for age analysis. Recovering CWTs provides the information necessary for determining origin and age structure (diversity metrics).

New redd locations should be captured using Global Positioning Satellites (GPS) to document spatial and temporal distribution (distribution metrics). This is done by flagging each new redd with surveyor ribbon, after a waypoint is taken, and labeling it with the distance from the ribbon and the date. On each subsequent survey, the number of new redds (those not yet flagged) and old (still visible) redds (those already flagged) can be counted, providing a census in survey areas without double counting redds.

Abundance estimates would be developed for each survey reach using AUC or redd count expansion from live and redd counts in conjunction with the apparent residence time and females (or fish) per redd estimates from Cedar Creek. Reach estimates are expanded to a total estimate using the GRTS sampling design. Assuming that all hatchery fish are marked and representative sampling occurs, an estimate of the number of hatchery spawners can be made by multiplying the percentage of hatchery fish (pHOS) by the total spawner abundance, and the number of natural origin spawners can be estimated by subtracting the number of hatchery origin spawners from the total spawners. The ages of wild origin spawners are based on scales collected from bio-sampling carcasses.

3.2.4 Carcass Tagging for Coho (mainstem only)

Baseline assessments will be made in 2011 and 2012 that will attempt to tag all carcasses in the mainstem. Tags will include numbered plastic discs. Depending on abundance it may be necessary to subsample the population as described in Section 2.2.4 to ensure that sampling occurs throughout the entire survey reach on each survey day.

For the mainstem Lewis River, Jolly Seber (JS) mark-recapture via carcass tagging is recommended as the primary methodology for adult coho abundance estimates. Carcass tagging will occur in 2012 and then every 5 years thereafter as approved by the HSS. This method requires surveying every 7 to10 days of the mainstem Lewis River from Merwin Dam to the downstream end of Eagle Island. This area is divided into smaller survey sections; identical to those currently used for fall Chinook surveys, to facilitate survey counts. The timeframe for surveying is similar to tributaries, beginning October 15 and continuing through January 31, as survey conditions allow.

Sampling during mainstem surveys is similar to tributary surveys, with the addition that coho carcasses are tagged. During peak abundance, counts will be made for live adult coho (classified as holders or spawners) and coho redds (for distribution metrics). Carcass surveys will continue every 7-10 days throughout the sampling period consistent with methods for fall Chinook surveys (abundance metrics). Tagged carcasses will be sampled for fork length, sex, the presence/absence of an adipose fin to determine wild/hatchery origin, and wanded for CWT presence. CWT positive fish will have their snouts taken for CWT recovery. Depending on abundance, a sub-sample rate may be necessary (Section IV, 3.2.5). Additionally, up to 150 natural origin coho (adipose intact, wand negative) should be scale sampled for age composition. Recovering CWTs provides the information necessary for determining origin and age structure (diversity metrics).

The carcass tagging method (and the accompanied analysis and assumptions) are described in detail in Kinsel et al (2009) (http://wdfw.wa.gov/publications/pub.php?id=00783), and are briefly summarized here. All carcasses that are not totally decomposed are tagged and biologically sampled as described above. Carcasses are tagged on both opercles with uniquely numbered plastic tags (McIssac 1977). Tags are placed on the inside of both opercles to limit predation and potential bias in recovery rates due to observation of brightly colored tags. Tagged carcasses are then placed into moving water to facilitate mixing with untagged carcasses (Sykes and Botsford 1986). On subsequent surveys, technicians record the tag numbers of recovered carcasses. When tagged carcasses are recovered, the tags are removed and fish are marked by removing the tail, which is denoted as loss on capture in the Jolly-Seber model.

Abundance estimates would be developed via JS mark recapture (Kinsel et al 2009). Assuming that all hatchery fish are marked and representative sampling occurs, an estimate of the number of hatchery spawners can be made by multiplying the percentage of hatchery fish (pHOS) by the total spawner abundance, and the number of natural origin spawners can be estimated by subtracting the number of hatchery origin spawners from the total spawners. The ages for hatchery and wild origin spawners are based on scales collected from bio-sampling wild origin carcasses and from hatchery records.

3.2.5 Sub-sampling

Depending on abundance, it may be necessary to subsample the number of coho tagged. If abundance is considered too much for completing the survey the determination will be made by field staff to subsample. Any subsampling will follow a systematic sampling approach whereby every 3rd or 5th fish is sampled as opposed to every fish. The selected sampling interval may be determined in the field to ensure completion of the survey reach

4.0 Juvenile Monitoring

Monitoring activities for both spring Chinook and coho salmon will be identical to winter steelhead and is described in subsection 2.2 of Section IV.

5.0 Additional Monitoring and Evaluation Activities

Various activities have been discussed in planning for monitoring activities for 2012. The two activities below represent potential programs for implementation in 2013.

5.1 Genetic Marker Protocol:

All adult carcasses will be sampled for genetics in 2012. This will involve the removal or punch from the caudal fin and placed in a labeled vial to be held for analysis. This process is required if the HSS determines that this methodology is practical in achieving the goals of the Hatchery and Supplementation program. This methodology will be incorporated into the 2013 plan if applicable.

5.2 Screw Trap Operation

The potential for installation of a screw trap in the mainstem Lewis River will be evaluated for placement in 2013. Site selection, permitting and installation logistics will be discussed at HSS meetings to determine the feasibility of installation and operation. For 2012, juvenile captures will rely on seining operations similar to 2011.

SECTION V. REPORTING REQUIREMENTS

A summary report will be generated describing results of implementing the 2012 Annual Operating Plan. The report will also make suggested recommendations for adaptive management of the program in the next year of implementation. Topics for inclusion will at a minimum include the following:

1.0 Adult Collection, Spawning and Monitoring

- Broodstock collection
    - Collections by location and method.
    - Actual collections vs. goals
- Genetic assignment results
- Numbers and locations of smolts released
- Spawning protocols – Goals vs. Actual
- Pathogen screening
- Problems encountered – what worked and what didn't?
- Recommendations for the following year

2.0 Egg incubation and Juvenile Rearing/Release

- Egg take – actual vs. goals
- Egg to fry survival – numbers of fish ponded
- Pathogen screening
- Rearing strategies
    - Heated water for incubation and rearing
    - Feeding strategies
- Release numbers, size, and location – egg to smolt survival
- Tagging summary
- Problems encountered – what worked and what did not?
- Recommendations for the following year

3.0 Monitoring and Evaluation

- Adult escapement estimates derived from redd and carcass surveys
- Adult composition of hatchery and wild steelhead returns through in-river netting and trapping ratios.
- Distribution maps of adults derived from redd and carcass surveys
- Juvenile residualism and migratory behavior of coho derived from radio telemetry or in-river seining and trapping.
- Juvenile distribution, species composition and relative abundance of hatchery and wild smolts
- Predation rates of both hatchery and wild smolts
- Discussion of relative collection efficiency of seining, including an evaluation of seine types, methods and sizes.
- Map of available seining locations from Merwin boat ramp to the downstream end of Eagle Island
- Problems encountered – what worked and what did not?
- Recommendations for the following year

4.0 Hatchery performance Data

Hatchery performance standards as outlined in Section 4.3.5 of the H&S Plan will be provided in annual reporting of the H&S program. This information will be collected by hatchery staff and reported in annual hatchery operating reports.

5.0 Consistency and Adherence with HSRG Guidelines

Annual reporting will provide the status and measures implemented to track the consistency of hatchery operations with recommendations of the Hatchery Scientific Review Group recommendations for the Lewis River hatchery complex.

6.0 Summary of Hatchery Upgrades Completed

Complete account of projects completed on schedule along with a summary of any projects delayed or modified.

SECTION VI. REFERENCES

Crawford, B.A. 1979. The origin and history of the trout broodstocks of the Washington Department of Game. Washington State Game Department. Olympia, WA.

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APPENDIX A: TABLE A-1: Hatchery Upgrade Schedule for 2012

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
LEWIS RIVER HATCHERY												
Downstream Intake Modifications												
Upstream Intake Repair												
Ladder Dredging												
MERWIN HATCHERY												
Ozone PLC and Power Switching												
Rearing Ponds												
SPEELYAI HATCHERY												
Pond 14 Conversion												
Modify Intake Structure												

APPENDIX B: Table B-1: Schedule of Monitoring Activities for 2012.

ACTIVITY	JAN				FEB				MAR				APR				MAY				JUN				JUL			AUG				SEP				OCT				NOV				DEC				
BROODSTOCK COLLECTION																																																
Steelhead Trapping				X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X																												
Steelhead Inriver Netting									X	X	X	X	X	X	X	X	X	X																														
Kelt Reconditioning									X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X																								
JUVENILE SEINING																																																
Spring Chinook													X	X	X	X																																
Early Coho																	X	X	X	X																												
Winter Steelhead													X	X	X	X	X	X	X	X																												
JUVENILE TRAPPING																																																
Screw Trap									X	X	X	X	X	X	X	X	X	X	X	X	X	X																										
REDD SURVYEYS																																																
Spring Chinook																														X	X	X	X	X	X	X	X											
Winter Steelhead													X	X	X	X	X	X	X	X	X	X																										
Coho Salmon	X	X	X	X																																		X	X	X	X	X	X	X	X	X	X	X
CARCASS SURVEYS																																																
Spring Chinook																														X	X	X	X	X	X	X												
Coho Salmon	X	X	X	X																																		X	X	X	X	X	X	X	X	X	X	X

2012 SAMPLE PROTOCOLS FOR NORTH FORK LEWIS RIVER COHO SPAWNING GROUND SURVEYS

- carc tagging all **Coho**- the carc tagging rate is 1:1
- Collect Bio-data from both Ad Clipped and NM coho
  - Ad Clipped and NM + bio-data will be recorded on a photo copied scale card
    - NOT TAKING SCALES!
  - NM bio-data will be recorded on a actual scale card
    - TAKING SCALES
- All datasheets / scale cards MUST be filled out with pencil.

HEADER INFO ON STREAM SURVEY DATASHEETS

- **Date –** remember to record the year as well
- **Sampler –** Use first initial and complete last name
- **Stream –** the specific stream you are surveying – write the complete name
- **Clarity (Visibility in feet)** – Record in feet (to the nearest ½ ft). If visibility is greater than 6 feet or clear to the bottom everywhere in shallow streams record as "6+".
- **Visibility -** Circle the most accurate description.
- **Reach Code –** Each fall Chinook survey section has a reach code. Record the proper reach code based on the river mile cheatsheets. The reach code is **alpha**/numeric
- **Survey Method –** Circle Walk, Raft, or Jetboat
- **Stream Reach ID –** Every survey section will have a reach code associated with it. Record the proper stream reach ID based on the river mile cheatsheets. This stream reach ID code is **numeric**- only
- **Survey Count Type –** Record the type of survey you are conducting.
  - FS = Full Survey - counts of all lives, deads, and redds and carcasses are bio-sampled.
  - CO = Count Only - counts of all lives, deads (pre-cuts vs. whole), and redds
  - CR = Carcass Recovery Only - no live or redd counts
  - NS = Not Surveyed - Attempted, but did not conduct due to conditions. Should have a visibility/clarity/flow reading at a minimum.
- **Flow –** Circle the most accurate description.
- **Weather -** Circle the most accurate description.

LIVES

- Record live counts of spawners and holders by species.
  - Spawners are any fish found in an area with spawnable habitat (in, on, or around tail outs, riffles, and glides with spawning substrate).
  - Holders are any fish found to be milling around/holding in areas where spawning does not occur (pools and long glides without spawning substrate).

- Record adults and jacks separately.
  - Chinook jacks <57 cm
  - Coho jacks <48 cm

REDDS

- **All coho redds will be counted 1 x week.** All redds will be recorded as new redds in the spreadsheet.
- The point of doing the count on Tuesday and carc tagging on Thursday and Friday is to keep a **consistent schedule throughout the sampling season**. Carcass sampling methodologies are designed to be an instantaneous event, meaning that all carcasses in the system should ideally be sampled during the same day/water conditions. For example sampling on back to back days if need be - Thurs and Fri is consistent with the methodologies. Spacing the carcass tagging days up throughout the week goes against the carcass tagging model.

Coho

- **During the peak of the early and late coho runs ALL COHO REDDS will be individually GPS'd.** During peak spawning for both runs all visible redds should be gps'd; no flagging is necessary! Record GPS accuracy on data sheet. See cheat sheet for naming convention.

Other species

- No GPSing or flagging redds. We are only counting COHO REDDS. If you see chum spawning let me know so the chum crew can be notified.

Redd Naming

- First 2 or 3 characters = name the reach code (NFL)
- Next 4 characters = date (mo/day)
- Next 2 characters = new redd number for the day
- Last character = your assigned alpha character
- Chip ( )
- Elise ( )

For example, if Jeremy Wilson was on the North Fork Lewis River in section 2 on 11/04 and he has his first new red of the day, he would enter: NFL2110401J

COHO DEADS - <u>Wand ALL COHO carcasses</u>

- **"NEW" CARCASSES (Carc Tags Out)**
  - Carc Tags Out - All fish you can CWT sample and <u>can tell if it has been previously carcass tagged.</u> No carcass tags present, <u>both opercles are intact</u> and in good condition to be tagged. **Record all bio-data and both carcass tag #'s.**
    - **NM CWT - fish – collect scale samples along with bio-data**
    - **Ad-Clipped and NM CWT + fish – only collect bio-data and record on photocopied scale card/notebook**
    - Carcass tag all carcass condition levels F, D-, and D
      - D+ carcasses will be added to the tagged sample if not enough tags are being put out
  - DO NOT CUT TAILS ON NEWLY CARC TAGGED COHO!

- Oddballs (no carc tags applied) – "New" carcasses that are not tagged must have a Carcass Category (2, 5, 6) assigned (use flow chart on cheat sheet). Cut tail to avoid sampling again.

- Sampling the carcass:
  - Collect 6 scales on all **UNMARKED, CWT NEGATIVE** coho
  - Use 2 columns per fish on the scale card.
  - **See scale card cheat sheet for details on what to collect/record and where to record it.**
  - **NOT** collecting DNA from coho on the main stem Lewis

- Returning tagged carcasses back to the water:
  - DISTRIBUTE tagged carcasses throughout the section they were recovered in
  - Carcs found close to where you worked them up can be put back into the edge of moving water
  - Carcs found in deep pools and far away from where you worked up the carcs **should be loaded back into the boat and distributed throughout the section they were recovered in**

Record:

- o Fork Length (to the nearest cm)
- o Sex
- o Marks (AD, LV, ADLV, or NM)
- o CWT Sample Category
- o SNID # if the fish wands + for a CWT
- o Spawn Success on Females
    - o Y=Yes for a spawned out fish or a partial spawn, N=No for a pre-spawn mort
- o Survey Section
- o DNA and/or Otolith label number
- o Carcass Condition/Gill Color
- o Carcass Tag numbers or Carcass Category if fish is not carcass tagged
- o Live tag color and numbers / Opercle punch side (left/right) and shape
    - o fall back fish out of Cedar Creek will have white numbered opercle tags (OPT) and potentially a white (WH), yellow(YEL), pink (PK) or orange (OR) Floy tag
        - ▪ **remove opercle tags and attach carcass tags**
    - o Lewis River Hatchery and Merwin Dam fish will have a upper caudle clip (UCC)
    - o Do not leave blank, if there are no tags or punches present record NP (none present), if you cannot determine if the fish was tagged record U (undetermined)

Example:

SCALE CARD NUMBER 8777					No Scales									NO SCALES				
POSITION NUMBER	1		2		3		4		5		6			7				
AGE																		
HATCHERY/WILD																		
FORK LENGTH (CM)	47		68		73		67		58		61			64				
SEX (M/F/J)	J		M		M		F		F		F			F				
MARK (CLIPS)	NM		NM		NM		NM		NM		NM			AD				
CWT /PIT SAMPLE CATEGORY					0						4							
SNOUT I.D. #					139													
SPAWN SUCCESS / SURVEY SECTION	Y	1	Y	2	Y	2	Y	4	N	5	Y	5		N	5			
DNA ID # / OTOLITH ID # PIT TAG #																		
CARCASS CONDITION/GILL COLOR OR SKIN COLOR	F	R	D+	P	F	R	F	R	D-	W	D	W		F				
CARCASS TAG #'S OR CARCASS CATEGORY #	23	24	CC4		27	28	29	30	31	32	CC2			33	34			
LIVE TAG COLOR AND # / OPERCLE PUNCHSIDE/SHAPE	NP	NP	UCC	NP	NP	NP	PK 974 6/47	OPT 678	NP	NP	NP	NP		OPT 1056	NP			

<u>SAMPLE CATEGORY CATEGORIES</u>

Blank = Bio-sampled, no carcass category.
0 = Biosampled and CWT +.
1 = Out of sample and CWT +.
2 = Out of sample, no CWT, but sampled For whatever reason.
3 = Out of sample, CWT +, not able To check for pit tags.
4 = Out of sample, not able to CWT sample Other bio data taken (Carcass categories 2 and 3).

<u>SPAWN SUCCESS CODES</u>

Y=Spawned out or partial spawn
N=Prespawn mortality

<u>CARCASS CONDITION CODES:</u>

L: Live, still kicking
F: Fresh, both eyes clear, Gills bright red.
D-: Slightly decayed, eye cloudy, firm flesh.
D: Decayed, eye cloudy, soft flesh.
D+: More decayed, eye cloudy, very soft flesh.
S: Skeleton, loosing flesh

<u>GILL COLOR CODES:</u>

R: Red, **P**: Pink, **W**: White

<u>LIVE TAGS/OPERCLE PUNCH:</u>

If tags or opercle punches are present, record tag color & number and/or punch side & shape.
NP = None present (able to check)
U= Undetermined (can't check or tell)

NF Lewis WRIA : 27-0168

River Miles

Section 1:	19.2 – 18.3	Merwin Dam – Rock Wall on Rv Right
Section 2:	18.3 – 17.5	Rock Wall on Rv Right – below Hagedorns, waterfall on Rv Left
Section 3:	17.5 – 16.7	below Hagedorns, waterfall on Rv Left – Top of Big Bar
Section 4:	16.7 – 15.7	Top of Big Bar – Lewis Rv. Hatchery
Section 5:	15.7 – 9.6	Lewis Rv. Hatchery – downstream end of Eagle Is.

Example:

CARD__1__ OF ___1___

CARD NO. 8777

DATE: 10/5/2011

SAMPLERS: J.WILSON

SAMPLE TYPE: (FISHERY, HATCHERY, STREAM SURVEY, TRAP/WEIR)

SAMPLE LOCATION: NF Lewis

Stream Reach ID: 27-0168, section 3

RM____17.5__ TO RM__16.7___

SPECIES: Coho, Early

DEADS___X____OR LIVES_________

SAMPLE TYPE: CWT ONLY_X_(only wanding for CWTs)

CWT AND PIT________

BIOLOGICAL 1 IN_____1______

CWT SAMPLE SIZE:____5______

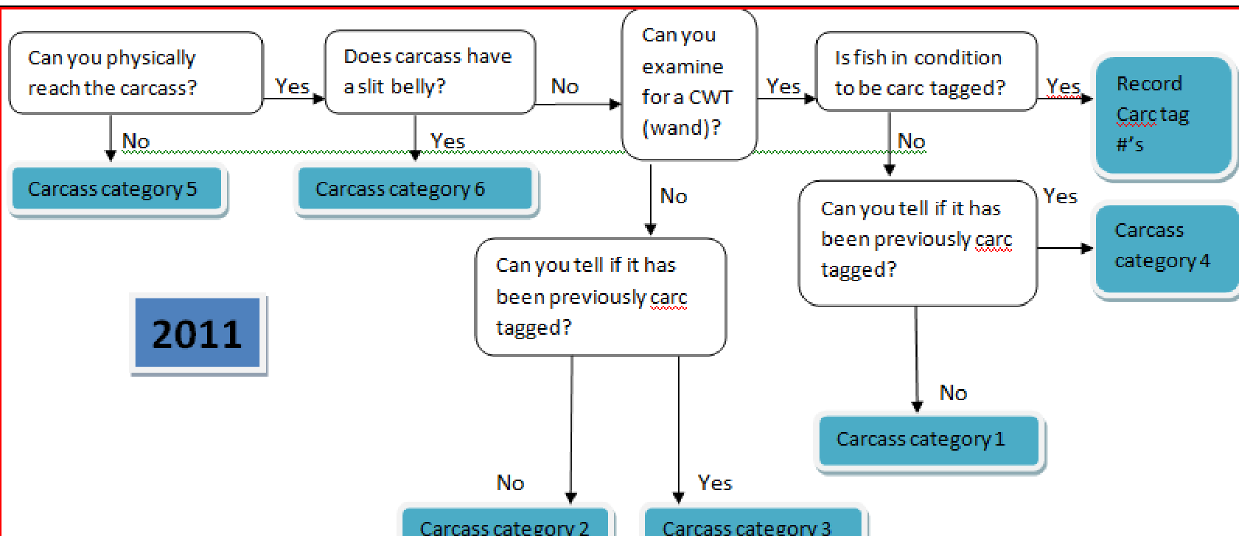
NUMBER OF CWTS_____1_______

PIT TAG SAMPLE SIZE:___________

NUMBER OF PIT TAGS _________

FINAL PLUS COUNT:_____0_____

COMMENTS:



Record all the info you can get off all carcass categories. Carcass categories 1 & 4 must be recorded on scale cards, carcass categories 2 & 3, can be recorded on regular or photocopied scalecards, and carcass category 5 & 6 will only be tallied on stream survey datasheet.

CWT Sampled Fish Total = # of carcass tagged fish +# of CC 1 + # of CC4.
Not CWT Sampled (NS) Total = # of CC 2 + # of CC3 + # of CC5.
CC 6 tallied on datasheet only.

CARCASS CATEGORIES (ODDBALLS)

- **Carcass Category 1:** Any fish that you can CWT sample, but cannot tell if it has been previously carcass tagged (missing portions of the head, missing one or both opercules). Record what data you can collect.

- **Carcass Category 2:** Any fish that you can't CWT sample. You cannot tell if it has been previously carcass tagged (missing portions of the head, missing one or both opercules). Record all the data you can collect.

- **Carcass Category 3:** Any fish that you can't CWT sample. You can tell if it's been carcass tagged (both opercula MUST be present). Record all the data you can collect (sex, FL, marks, etc).

- **Carcass Category 4:** Any fish that you can CWT sample, you can tell if it has been previously carcass tagged, but you don't want to tag it.

- **Carcass Category 5**: You are not able to examine, but can ID species (too deep to recover). Tally these on datasheet.

- **Carcass Category 6:** Any fish with a slit belly. Do NOT sample or carcass tag. Tally these on datasheet.

ON YOUR SCALE CARD

- CWT sample size is the number of fish on the scale card that you were able to wand.

- **DO NOT** include Carcass Category 2, 3, 5 and 6 in the CWT sample size.

- **DO** include Carcass Category 1 and 4 in the CWT sample size.

RECOVERED CARCASSES

When coho are recovered with carc tags inside opercules and tail intact - record carc tag numbers, remove carc tags, and record BOTH CARCASS TAG #'S on the white board **and CUT TAIL.** Keep recovered tags until all #s have been double checked.

PREVIOUSLY SAMPLED

- Count the # of cut coho tails as you are conducting the live count
- Only fish that have cut tails are recorded on the white board (not carcass tag recoveries).
- If cannot differentiate between species with cut tails DO NOT COUNT
- Do not dig through piles of carcasses to find cut tails
- This data is collected as a standard piece of data

OTHER SALMONID SPECIES - DEADS

- **CHINOOK**
  - **RETURN ALL CHINOOK TO THE RIVER.** These fish are not being sampled on the coho sampling days.
  - Record by section any observed tags – Floy, carcass or opercle

- **STEELHEAD**
  - Wand <u>ALL</u> steelhead.
  - **For CWT+ steelhead:** Take snout (fill out snout label completely; record the fork length, sex, and SNID # on back of the white board and enter this data into the CWT recovery spreadsheet after returning to the office. Cut off tail.
  - **Ad-clipped steelhead:** Tally by adult or jack on back of the white board and cut off tail.
  - **Unmarked (NM) CWT- steelhead:**
    - Collect 6 scales
    - Record fork length, sex, mark (NM), and spawn success (Y or N)
    - Cut off tail after sampling
    - These fish, if you recover any, will then be tallied on the Stream Survey Counts spreadsheet.

- **CHUM**
  - **Sample ALL chum**
  - No need to wand chum
  - Collect 3 scales
  - Record FL (to the nearest cm), sex, mark, spawn success for females
  - Remove entire head from all chum carcasses, put into a snout bag and record all data on the SNID label. On the back of the white board record the fork length, sex, and SNID #. Be sure to notify Julie or Todd Hilson upon your return to the office if a chum sample is collected or lives are observed.
  - Cut off tail after sampling
  - Note all live fish observed on the survey card

- **PINK**
  - Sample all Pinks as time allows
  - Collect 3 scales
  - Record FL (to the nearest cm), sex, mark, spawn success for females
  - Collect a DNA sample
  - Cut off tail after sampling
  - Enter DNA bio-data on spreadsheet

<u>Spawning Ground Survey Data Management</u>

<u>Daily Data Management after survey:</u>

MAKE A PAPER COPY OF THE WHITE BOARD
SCAN THE WHITE BOARD AND EMAIL TO JULIE

SUMMARIZE ALL DATA and record on photocopied sheet of the white board (a.k.a. datasheet)

Live counts and redd counts – circle final totals

Record the number of newly tagged carcasses by fin marks and CWT status:

Ad Clipped -	Unmarked -	Unk -
Ad Clipped +	Unmarked +	Unk +

Record the number of fish examined in each carcass category:

Carcass Category 1
Carcass Category 2
Carcass Category 3
Carcass Category 4
Carcass Category 5
Carcass Category 6

Make sure all chum, pink and steelhead data is recorded on datasheet

Double check that all counts match on datasheet and scale card (ie. Carcass category counts and number of bio-data fish). After confirming, circle the total. **Make sure all recorded and photo copied #'s are legible.** Keep recovered carcass tags until you return to the office so you can double check a recovered tag # if there is a question.

Scale cards - Ensure that both the front and back of the scale cards are filled out **completely.**

Put completed datasheets and scale cards on Julie's desk.

<u>Snouts/CWTs</u>

Before snouts are placed in the freezer:

1. ALL SNOUTS MUST BE RECORDED IN THE CWT RECOVERY SPREADSHEET PRIOR TO BEING PLACED IN THE FREEZER.

2. To complete the CWT recovery spreadsheet you will need:

   i. Fork Length

   ii. Sex

   iii. SNID #

   iv. Recovery location

3. For coho, the info needed to complete the CWT recovery spreadsheet is captured on the scale card. Ensure that the SNID # and sample category are recorded in proper place on the scale card for each snout collected.

4. For chum and steelhead, you will need to record the SNID #, fork length, and sex of each snout recovered on the white board in the field prior to putting the snouts in the freezer in order to complete the CWT recovery spreadsheet.

5. **Make sure the number of snouts being placed in the freezer matches the number recovered on the scale cards, datasheets, and the CWT recovery spreadsheet.**

6. Snouts need to be bagged in the freezer by species and by collection method. Attach toe tag to large bag to differentiate between different projects

7. **Make sure the SNID label is visible on the outside of the snout bag.**

Equipment Needed

- Lifejacket
- Knife/sheath
- Snout Labels
- Snout Bags
- Scale Cards
- Scale Card Holder
- Sharpies
- Flagging tape
- Sampling Vest
- Waders/Wading Boots
- Rain jacket
- Polarized sunglasses
- Gaff/walking stick
- Carc tags
- Stapler
- Staples
- Hemostats
- Clickers
- Pencils
- White Board
- Cheat Sheets
- Protocol Sheet
- Wand
- First aid kit
- Food and water
- Measuring Tape

Attachment F

Hatchery and Supplementation Plan
2011 Annual Report

Lewis River Hydroelectric Projects

FERC Project Nos. 935, 2071, 2111, 2213

2011 Annual Report

Hatchery and Supplementation Program

PACIFICORP ENERGY
A DIVISION OF PACIFICORP

Erik Lesko
April 2012

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Appendix B - Genetic Assignment Results from Lewis River Captures - 2011

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Appendix E - Wild Winter Steelhead Spawning Log - 2011

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1.0 Introduction

The purpose of this report is to document results from field assessments associated with implementation of the Hatchery and Supplementation (H&S) Program during 2011. Monitoring and evaluation activities are planned in consultation with the Hatchery and Supplementation subgroup and incorporated into the Annual Operating Plan (AOP) each year. In 2011, several programs were initieated including radio telemetry studies on coho smolt outmigration, abundance estimates for adult steelhead and salmon, juvenile seining efforts and ongoing wild winter broodstock collection and rearing programs.

This report is required by Section 8.2.4 of the Lewis River Settlement Agreement which states:

"On an annual basis, the Licensees shall provide to the ACC for review and comment a report compiling all information gathered pursuant to implementation of the Hatchery and Supplementation Plan. The report also will include recommendations for ongoing management of the Hatchery and Supplementation Program. The ACC shall have 60 days to comment on the annual report. Within 60 days of the close of the comment period, the Licensees shall finalize the report after consideration of all comments. The Licensees shall also provide the comprehensive periodic review undertaken pursuant to Section 8.2.6 below to the ACC. The Licensees shall provide final annual reports and the comprehensive periodic review to the Services during the development of any required ESA permit or authorization for hatchery operations, including NOAA Fisheries' HGMP process. The report may be included as part of the detailed annual reports of the ACC activities required by Section 14.2.6."

2.0 Winter Steelhead

Table 1 Summary information of winter steelhead program 2009 to 2011.

	NUMBER OF STEELHEAD		
METRIC	**2011**	**2010**	**2009**
Total Transported to Merwin hatchery (all methods)	75	98	74
Total Released Back to River (from hatchery)	34	47	35
Total Spawned	35	46	31
Total Mortality	5	4	8
Lethally Removed (hatchery fish)	1	1	0
Egg Take	89,490	93,218	54,240
Egg Loss	12%	8%	22%

2.1 Broodstock Collection

Broodstock collection relied on two methods: (1) trapping at Merwin dam and (2) in-river netting. Cedar Creek weir did not contribute any broodstock in 2011. The use of anglers and professional guides was discontinued in 2011 due to difficulty in coordinating this effort and concerns with handling listed species by the public. Transportation of adult broodstock collected in-river was accomplished by holding fish in insulated coolers filled with fresh river water and use of rubber mesh nets to transfer fish from the coolers to holding tanks on shore. Most unmarked winter steelhead were transported (via the insulated coolers) to the Lewis River hatchery river access area where an oxygenated holding tank was available. Fish were transferred to the oxygenated holding tank with the rubber mesh nets. Steelhead captured in the Merwin trap were transferred to the Merwin hatchery via fish transport trucks. No mortalities were observed using these procedures. Data for all steelhead transported to the Merwin hatchery is provided in Appendix A.

Table 2. Number of steelhead captured from various methods from 2009 to 2011

	NUMBER OF STEELHEAD		
CAPTURE METHOD	**2011**	**2010**	**2009**
MERWIN TRAP	**25**	**48**	**27**
CEDAR CREEK WEIR*	**0**	**6**	**0**
TANGLE NET	**65**	**42**	**39**
ANGLING	**0**	**2**	**8**

* Represents number recaptured and transported to Merwin hatchery

2.1.1 Merwin Trap

The first unclipped steelhead was collected at the Merwin trap on December 21, 2010. All unclipped fish captured prior to January 27 were not held for broodstock. Rather, a genetic sample was taken (fin punch) and each fish was PIT tagged prior to release back to river. These 'early' fish are not held due to the high likelihood of hatchery influence in these fish. Of the 11 fish captured prior to January 27, six (6) were primarily of hatchery origin and none were native to the Lewis River system.

In total, 25 unmarked steelhead were collected from the Merwin fish during the period December 21, 2010 through May 31, 2011. Retention of broodstock began on January 27, 2011. Of the 25 unmarked steelhead taken to the hatchery, eight (8) were eventually spawned, one (1) was a mortality, one (1) was intentionally removed and fifteen (15) were released back to the river due to genetic assignment. Figure 1 illustrates the catch frequency of unclipped steelhead entering the Merwin trap during the collection period.

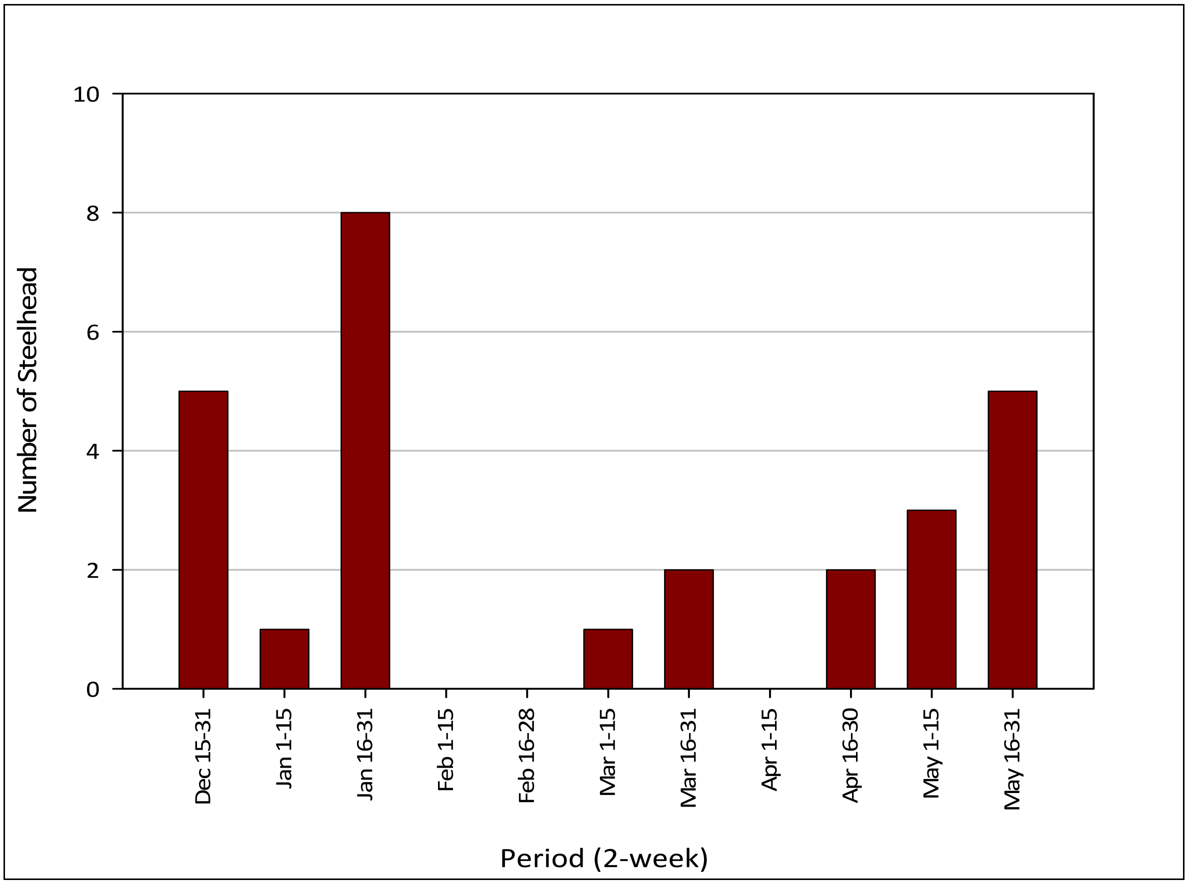

Figure 1. Frequency of unclipped winter steelhead captured at the Merwin fish trap between December 21, 2010 and May 31, 2011 (n= 25).

2.1.2 In-River Netting

In-river collection efforts began on January 26, 2011 and continued through May 31, 2011. One or two crews typically went out once per week depending on river conditions. Crews consisted of two to three people and boat. Six to eight pound test monofilament, 4-inch (stretch) mesh tangle nets were drifted in known and established steelhead holding areas. Once a steelhead became entangled in the drifting net it was pulled into the boat and freed from the net, then placed in an insulated cooler with fresh river water. Steelhead were then transported to the oxygenated holding tank at the Lewis River hatchery access area.

In total, 65 unmarked steelhead were captured through the tangle netting program (Figure 2). Of these fish, 15 were released back to the river due to ripeness or evidence of post spawning (kelts); 27 were spawned at the hatchery, 4 were mortalities, and 19 were released back to the river from the hatchery based on genetic assignment.

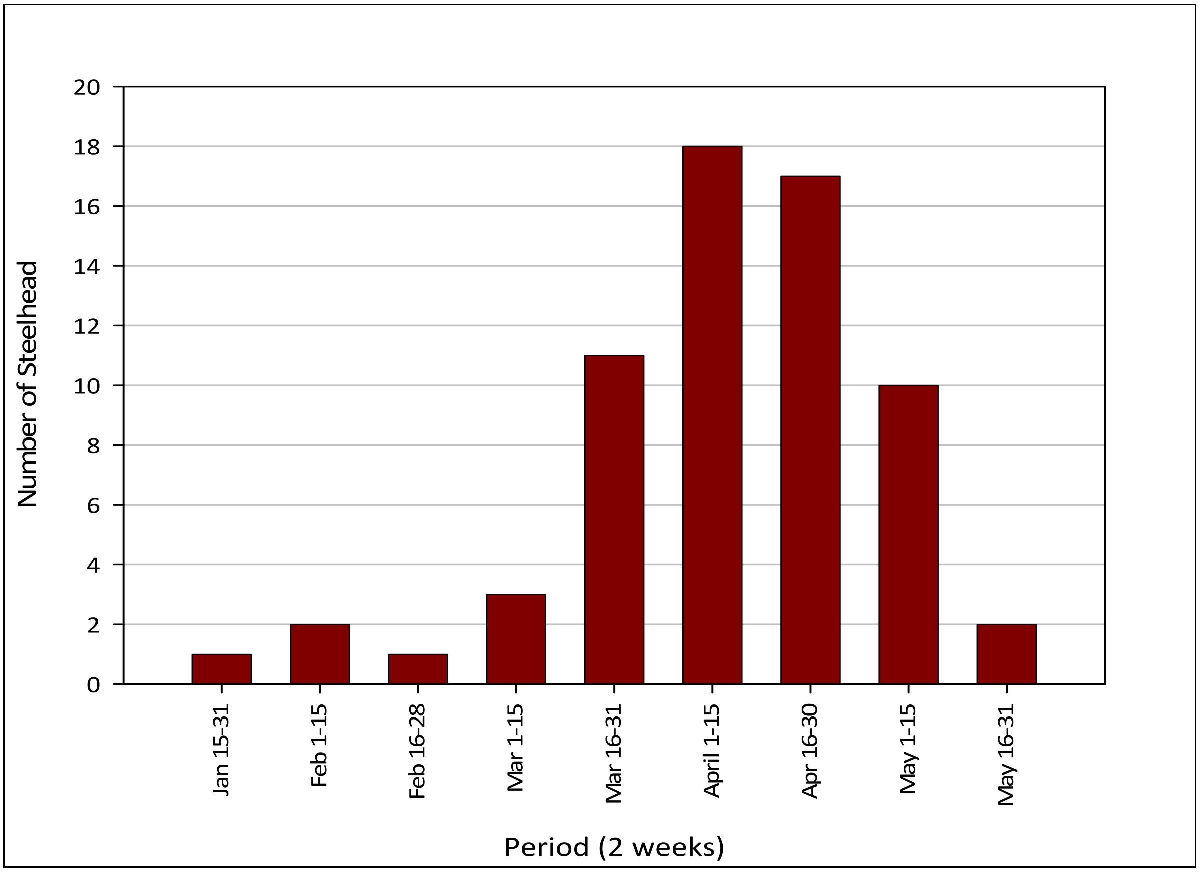

Figure 2. Frequency of capture of unclipped winter steelhead from in-river tangle netting efforts between January 26, 2011 and May 31, 2011 (n=65).

2.1.3 Cedar Creek

No winter steelhead were transported from Cedar Creek to Merwin hatchery. Therefore, no winter steelhead captured from Cedar Creek were used as broodstock. However, a substantial influence from Cedar Creek stock is observed in the genotype of the broodstock (see Section 2.3).

2.2 Fish Collection Timing

The ability to conform to predetermined collection curves presents several difficulties in the field. Specific issues continue to make broodstock collection problematic. These specific issues include the following:

- More fish (than stipulated in the collection curve) need to be captured each period to ensure assignment analysis will not reduce available broodstock below target levels
- Spawning maturity is a significant variable during spawning and adds uncertainty when deciding to retain or release broodstock. This is most notable in females rather than males.
- Capture efficiency is affected by river conditions which can change weekly if not daily
- Gender ratios need to be managed and maintained to ensure adequate number of crosses and limited multiple use of broodstock males
- Steelhead condition varies throughout the collection period with a larger percentage of fish being returned to river later in the collection window due to ripeness, and,
- Fecundity varies substantially from fish to fish and from year to year.

Because of the many unknowns with collecting live fish in their natural environment, the collection curve is intended to be a guide for collection crews to help plan fish collection activities on a weekly basis. This planning helps to ensure that fish are collected across their spawning period and helps ensure genetic diversity among the available broodstock.

The first steelhead retained for broodstock was on January 27, 2011 from the Merwin trap. This fish was later spawned on April 18. The first steelhead captured through in-river tangle netting was on January 26, 2011. This fish was released due to genetic assignment outside the Lewis River basin. The first tangle netting steelhead used for broodstock was captured on March 22, 2011. Ten of the 35 steelhead (29%) used in the broodstock were captured by tangle net during the last week of March. In-river tangle netting efforts substantially ended on May 5; however, a final trip was scheduled on May 31 but neither of the two fish captured on this day were used as broodstock. The last broodstock captured at the Merwin trap was on May 16. In-river tangle netting efforts past mid May do not appear to benefit broodstock collection due to the high proportion of ripe or post spawn captures.

Figure 3 provides the timing of actual captures of steelhead from all available methods as compared to the predetermined collection curve. According to the collection curve, a total of 50 steelhead are to be held for broodstock and spawned. In 2011, only 41 steelhead were spawned due to higher than expected fecundity.

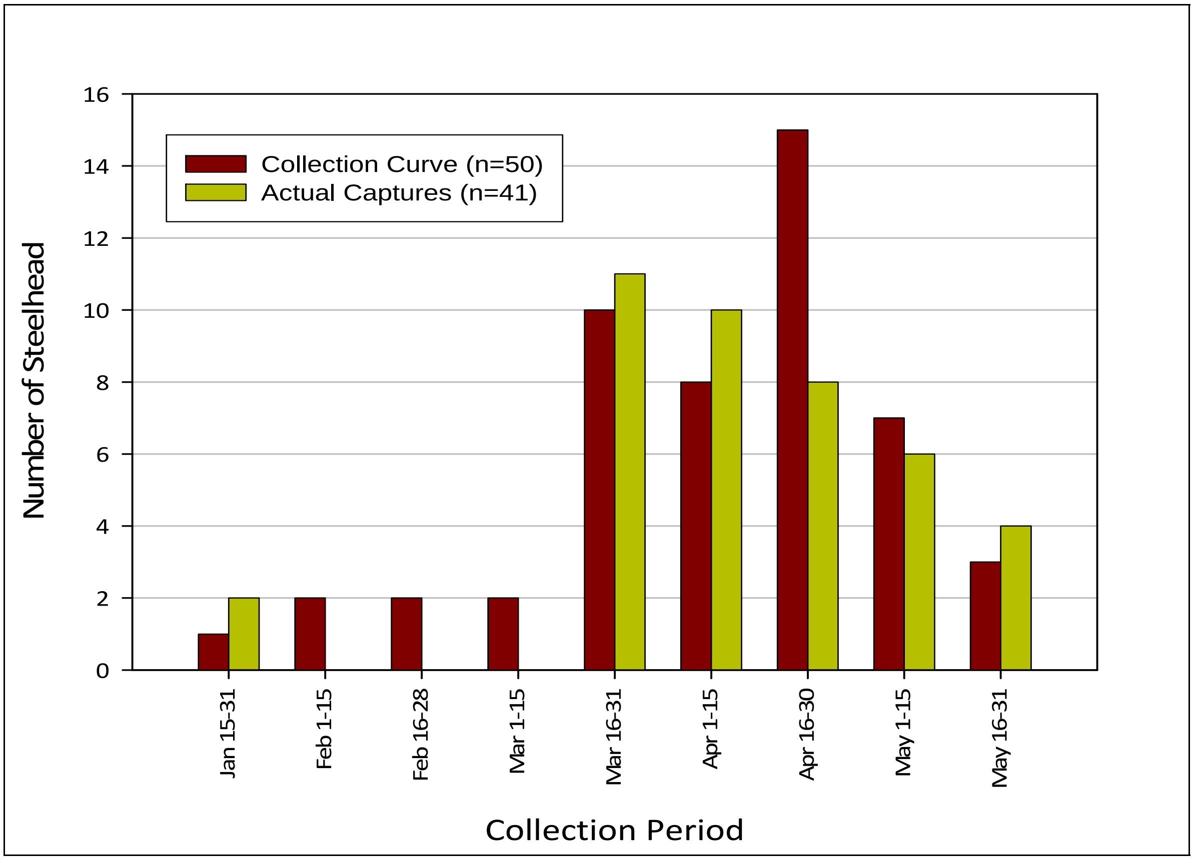

Figure 3. Actual collection timing of steelhead used as broodstock compared to predetermined collection curve (includes mortalities)

2.3 Genetic Analysis

The Hatchery and Supplementation subgroup agreed to use a genetic assignment level of 50 percent or greater to the NF Lewis River or Cedar Creek stock(s) to identify acceptable broodstock. Additionally, steelhead captured after April 1 with 50 percent or greater assignment to the Cascade Strata are also considered acceptable broodstock. The only exception to this rule is for fish showing hatchery assignment at levels greater than 5 percent. These fish would not be incorporated into the broodstock despite any assignment of 50 percent or greater to the NF Lewis River wild winter steelhead stock or Cascade Strata.

A total of 90 unclipped steelhead were analyzed and assigned a probability percentage. Figure 4 provides a summary of those results using only the greatest probability (primary). Appendix B provides the results for each individual unclipped steelhead. Appendix C provides genetic assignment for fish collected at the Cedar Creek Weir and released.

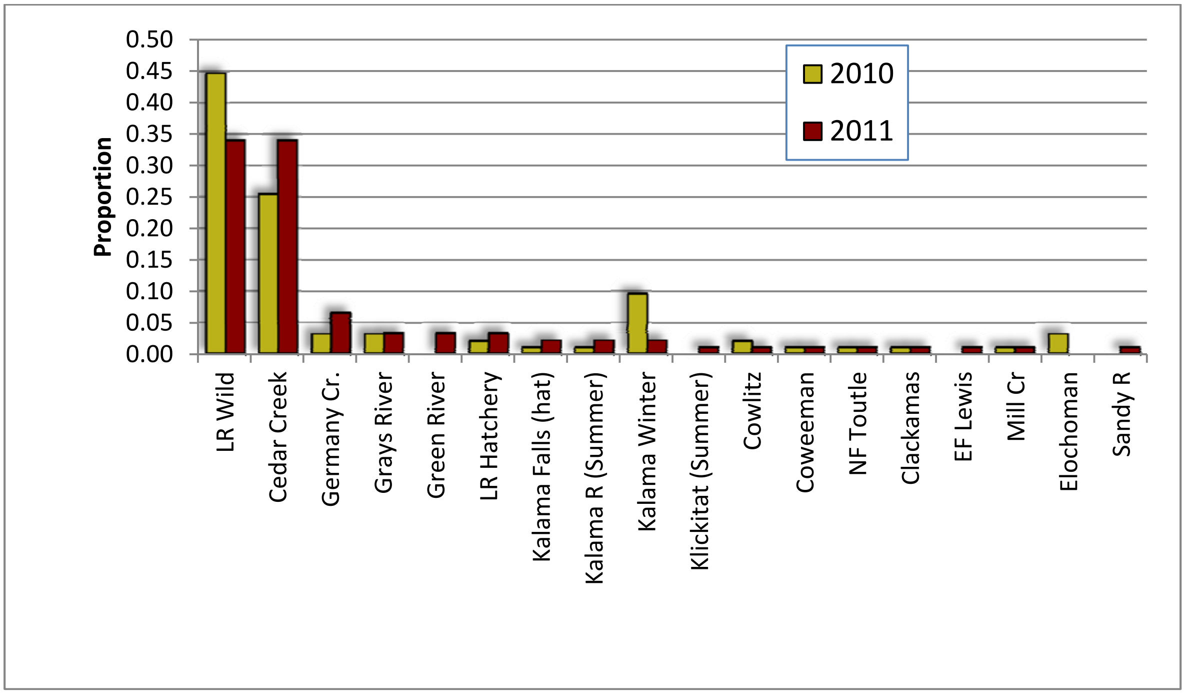

Figure 4. Proportion of <u>primary</u> genetic assignment for all steelhead captured in both 2010 and 2011

By evaluating assignment probabilities greater than five percent, a clearer understanding of the contribution of each stock to the Lewis River basin is possible. This eliminates potential error resulting from very low probabilities. Figure 5 provides the proportion of all stocks identified through genetic assignment analysis with assignment probabilities greater than 5 percent. By including all stocks with at least a five percent probability it becomes evident that Cedar Creek is slightly higher contributor of genetic assignment than the North Fork Lewis River. The third highest contributor to the lower river stock is Germany Creek, which is unusual given the proximity of the Kalama system to the Lewis. When combining all three stocks, Lewis River, Cedar Creek and Germany, the total contribution from these three stocks account for 67 percent of the total genotypic probability.

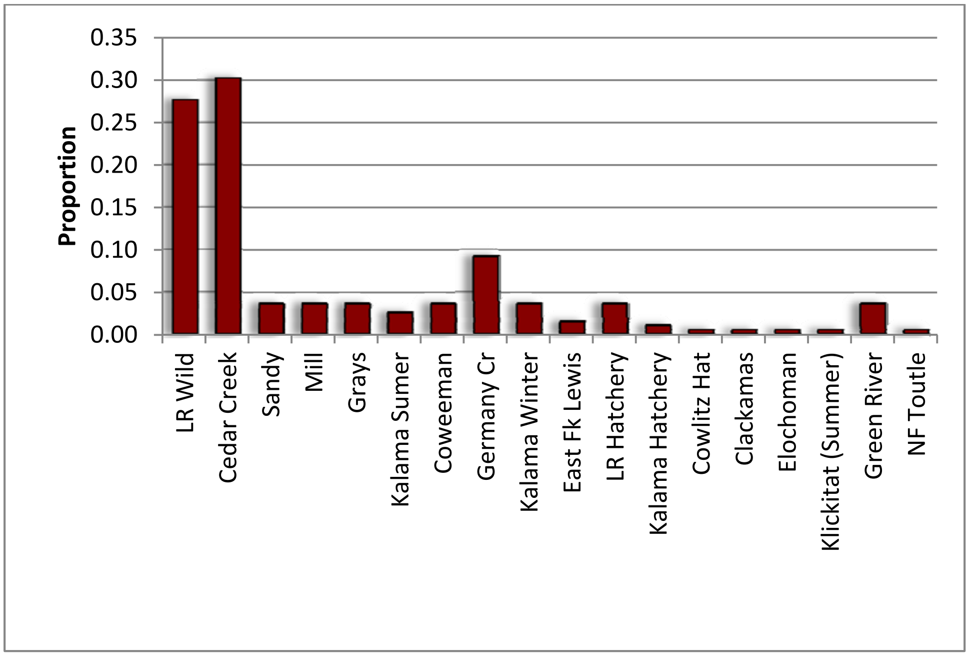

Figure 5. Proportion of genetic assignment among all steelhead tested with at least a five percent (5%) assignment probability (n=90)

2.4 Spawning

A total of 22 females were spawned with 24 males. These fish represent the 2011 broodstock and are summarized in Appendix D. Spawning events took place during the period March 17, 2010 to May 14, 2010 (Figure 6). The target number (goal) is 25 females and 25 males. While the target number was not reached for both females and males, the fecundity of each female was higher than expected. Thus, the egg take goal of 80,000 was exceeded by 9,490 eggs (egg take 89,940) resulting in an eyed egg take of 79,995 (12% dead eggs). Appendix E provides the spawning log for 2011 indicating fecundity, crosses, eyed egg take and an estimate of fry ponded.

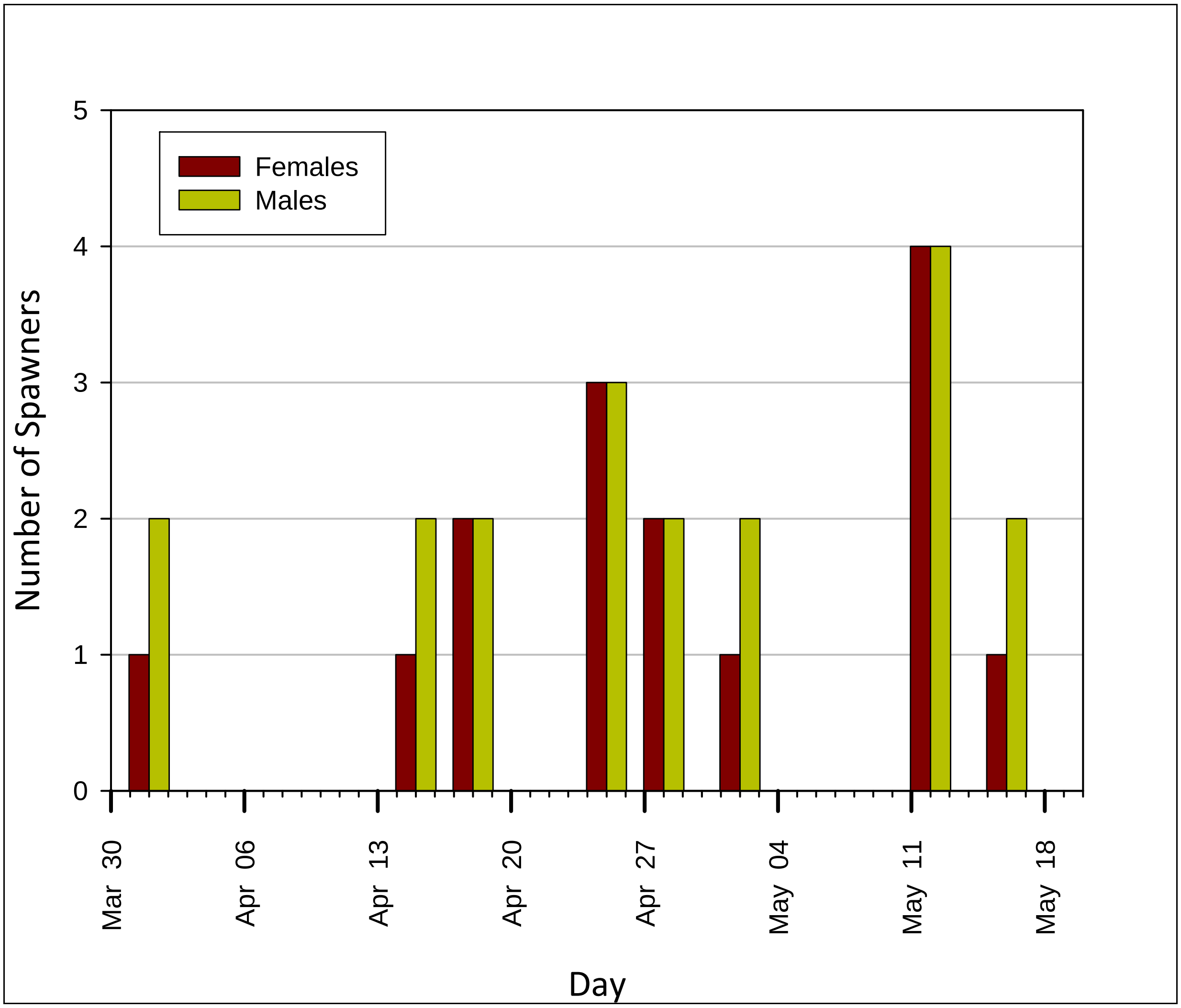

Figure 6. Number and timing of winter steelhead (males and females) spawned at Merwin hatchery (n=34).

2.5 Rearing, Tagging and Release

Mortality rates associated with Columnaris (*Flexibacter columnaris) and Bacteria Coldwater Disease* were significant again in 2011. Of the 79,100 fry ponded, nearly 46.2 percent (36,580) succumbed to these two diseases. The mode of transmission for the *F. columnaris* infection in 2011 is unknown.

2.5.1 Rearing

Table 3 Summary of rearing statistics for the 2011 brood year

GENERAL	STATISTIC
Egg Take	89,940
Eyed Eggs	79,995
Total Ponded	79,100
Food Conversion	0.8:1
MORTALITY	
Total Egg Loss	8,322
Total Pond Loss	37,560
Due to natural causes	980
Due to feed related issues	0
Due to disease (Columnaris)	11,010
Due to disease (BCW)	25,570
Overall Loss (egg and pond)	45,882
Shortage	6,840
RELEASE	
Projected Smolt Release (survival)	34,500
Release Date	May 14, 2012
Release size	7-8 fish/pound

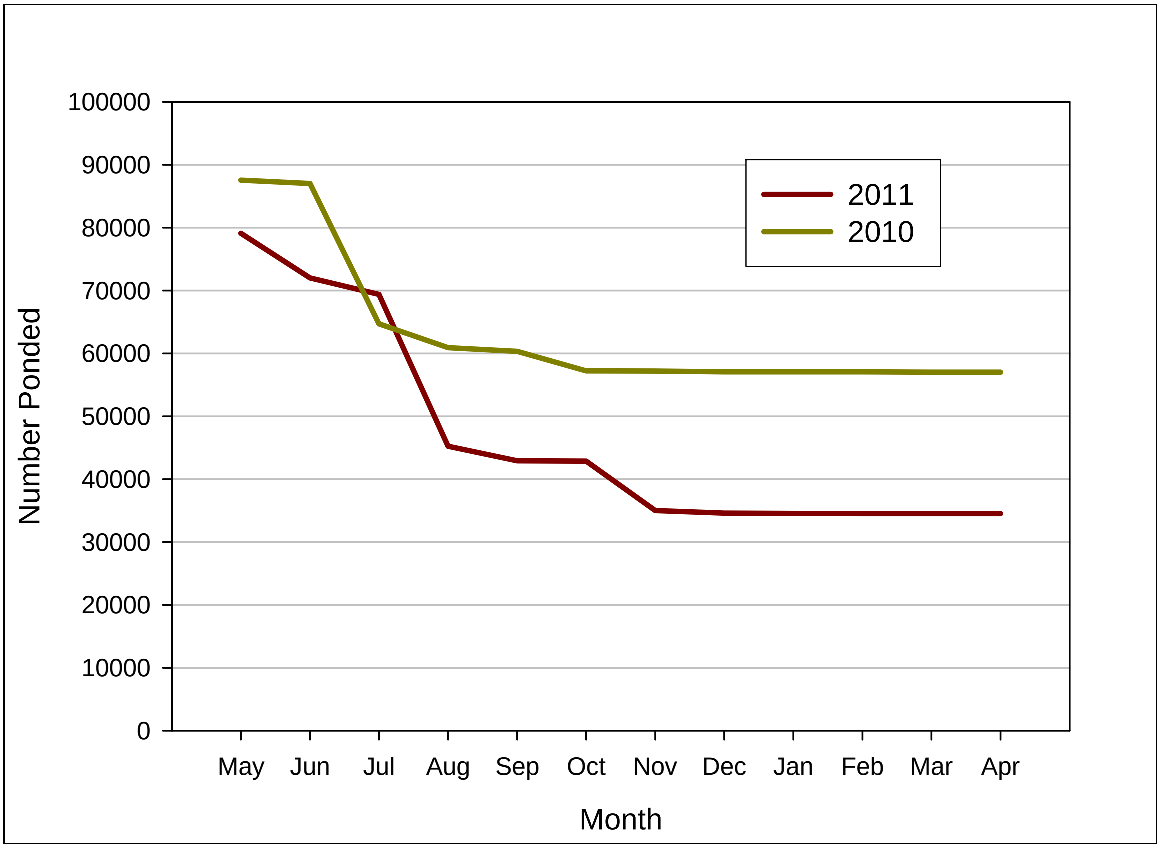

Figure 7. Observed mortality rate of fish ponded during the 2010 and 2011 rearing cycles.

2.5.2 Tagging

All fish were tagged with blank wire snout tags on December 13-15 of 2011. A total of 57,114 fish were tagged as there was a shortage of 5,698 fish compared to inventory projections inventory.

2.5.3 Release

All fish will be released no later than June 1, 2012 at the Merwin boat launch. A total release number of 34,500 smolts is projected. All fish that leave the rearing ponds volitionally will be released at the Merwin boat ramp. Any remaining smolts will be released downstream at the County Bridge in Woodland. Target release size is 7 to 8 fish per pound.

3.0 Monitoring and Evaluation

3.1 Winter Steelhead Redd Surveys

3.1.1 Abundance

Abundance estimates are derived by using a multiplier on the total number of redds observed. This method assumes an equal sex ratio. Table 4 provides abundance estimates for years 2008 through 2011.

Table 4: Estimates of Wild Winter Steelhead Abundance Downstream of Merwin Dam 2008 through 2011.

Year	Estimate (0.81 X No. of redds)
2008	106
2009	143
2010	201
2011	87

3.1.2 Distribution

Steelhead distribution is provided for the years 2008 through 2011. This information is not available in previous reports. Figure 8 provides the number of redds observed by reach. Reach number 5 has the most redds, but is also the longest reach. Reach breaks coincide with WDFW reach breaks used for fall Chinook sampling. Distribution maps are provided in Appendix F.

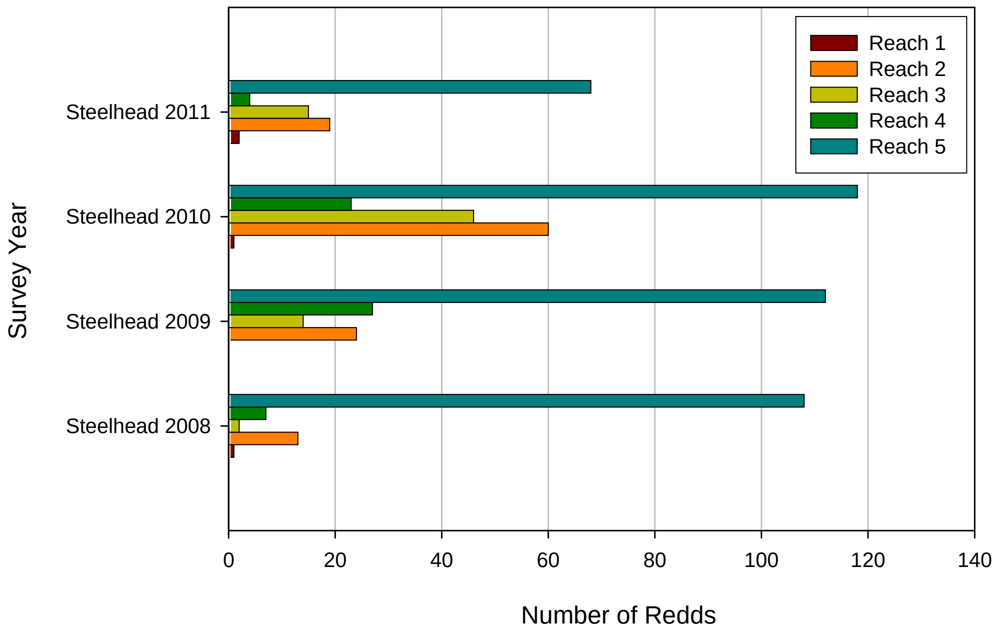

Figure 8: Steelhead redds observed by section between 2008 and 2011 downstream of Merwin Dam

3.2 Salmon Redd Surveys

3.2.1 Spring Chinook

Spring Chinook redd counts took place on August 29 and September 7 by PacifiCorp staff. The August 29 survey yielded no redds and only 2 live spring Chinook. On September 7, three redds were observed in section 4 in the riffle just upstream of the Lewis River hatchery; one live in section 1. Section 5 contained 5 live salmon and 4 redds (1 in north channel of Eagle Island and 3 along the south channel of Eagle Island. No other data were provided by WDFW.

3.2.2 Coho Salmon

The number of coho redds observed in 2011 were both early and late coho were 51 and 253, respectively (Figure 9).

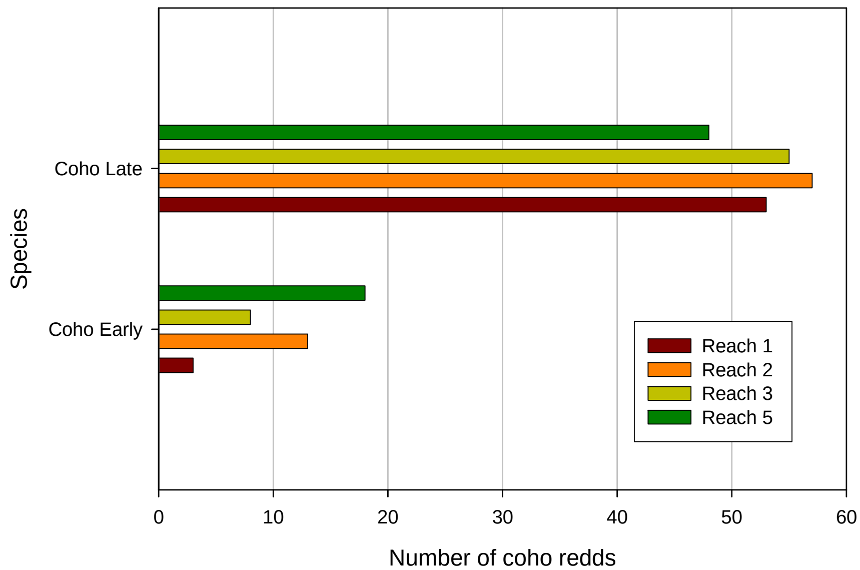

Figure 9: Number of Coho redds observed downstream of Merwin Dam by reach for both early and late coho

3.3 Radio Telemetry (coho salmon smolts)

Radio telemetry was used to evaluate migratory behavior and timing of hatchery coho smolts once released from the Lewis River hatchery. A key objective of this study was to evaluate the rate at which smolts left the system, thus reducing the potential effects of competition or predation on wild smolts.

A total of 50 smolts were tagged with Lotek wireless NTQ-2 gastric radio transmitters. Burst rate was programmed at 7 milliseconds and frequency was set at 149.300 Mhz (coded).

On May 3, 2011, smolts were netted from the volitional release raceways (intermediate) at Lewis River hatchery. Each smolt was measured and visually inspected to be in good health (Appendix G). Smolts were anaesthetized with MS-222 prior to tag insertion. After tagging each smolt was placed into individually partitioned fry troughs overnight to assess tag retention and mortality. No mortality was observed, however four fish regurgitated their tags. These fish were retagged. Summary information on fish lengths is provided in Table 5 and Appendix G.

Residency time was substantially less in 2011 than in previous studies conducted in 2001 and 2002. After 18 days from release, only 10 percent of the tagged coho smolts had not passed the lowest detection point at the Woodland Airport (Table 5). Conversely, both in 2001 and 2002, forty percent (40%) of the smolts remained in the system after 22 days post release. This is supported by seining activities in which no hatchery coho smolts were captured. Reasons why smolts appeared to emigrate from the system so quickly is undetermined. The only two notable differences between the study in 2011 and previous studies is the time of release and to some extent higher flows in 2011 compared to previous years. The release time in 2001 and 2001 was April 9 and April 4, respectively. The release time in 2011, was nearly a month later which may have caused a faster emigration rate due to advanced smoltification of the fish.

Table 5: Radio telemetry statistics for coho migration and tracking data for 2011

Statistic	Value (mm)
Mean Length	137.2
Standard Error	1.15
Standard Deviation	8.16
Minimum Length (FL)	119
Maximum Length (FL)	156
Residency Time	
% remaining after 7 days	56
% remaining after 13 days	50
% remaining after 18 days	10

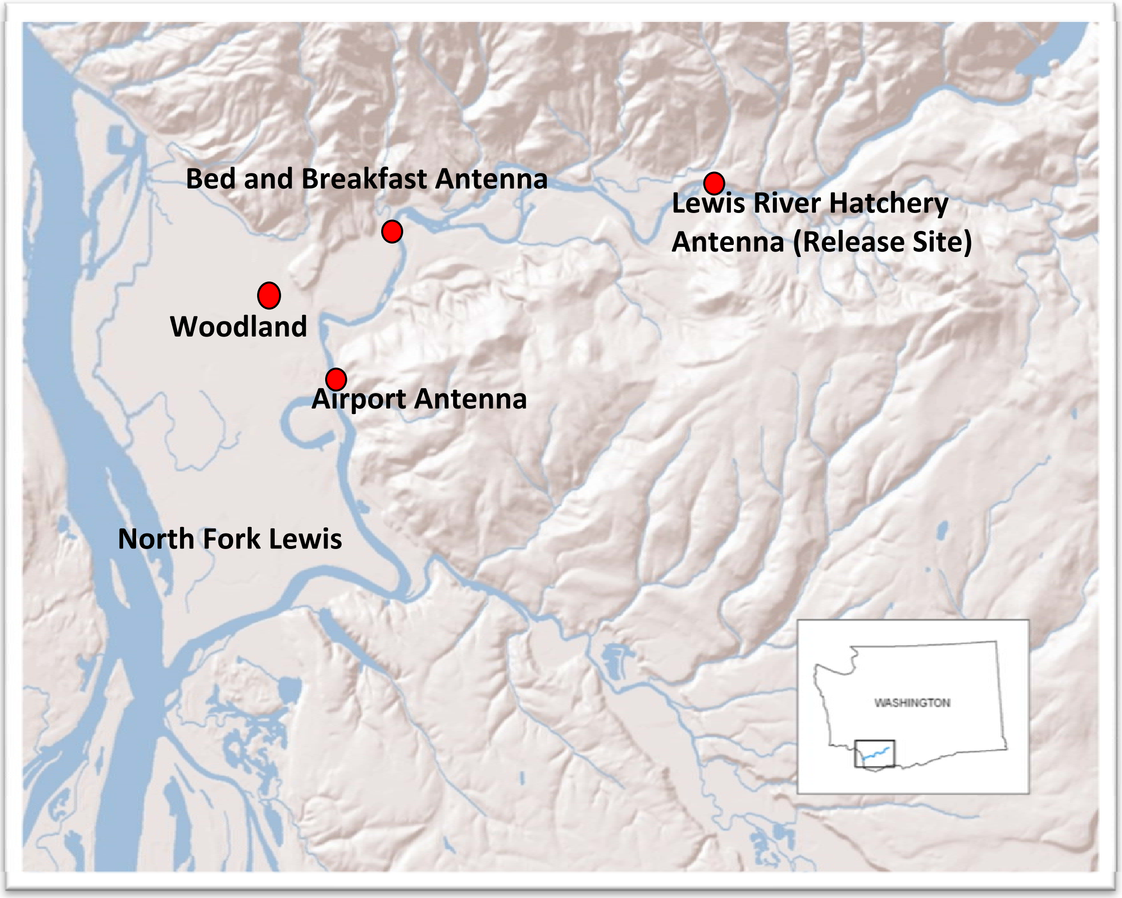

Figure 10: Location of fixed radio stations

On May 4, 2011, all smolts were released at the Lewis River hatchery by hand. A series of three fixed radio receivers were planned however only the Lewis River hatchery receiver was active at the time of release due to delays by the vendor in providing the correct radio receivers for the transmitters. The other two sites: Lewis River bed and breakfast and the Woodland Airport became operational on May 6 and May 11, respectively (Figure 11). In addition to the fixed stations, a mobile survey was completed on May 11 to assess fish location due to the delays in obtaining new receivers from the vendor.

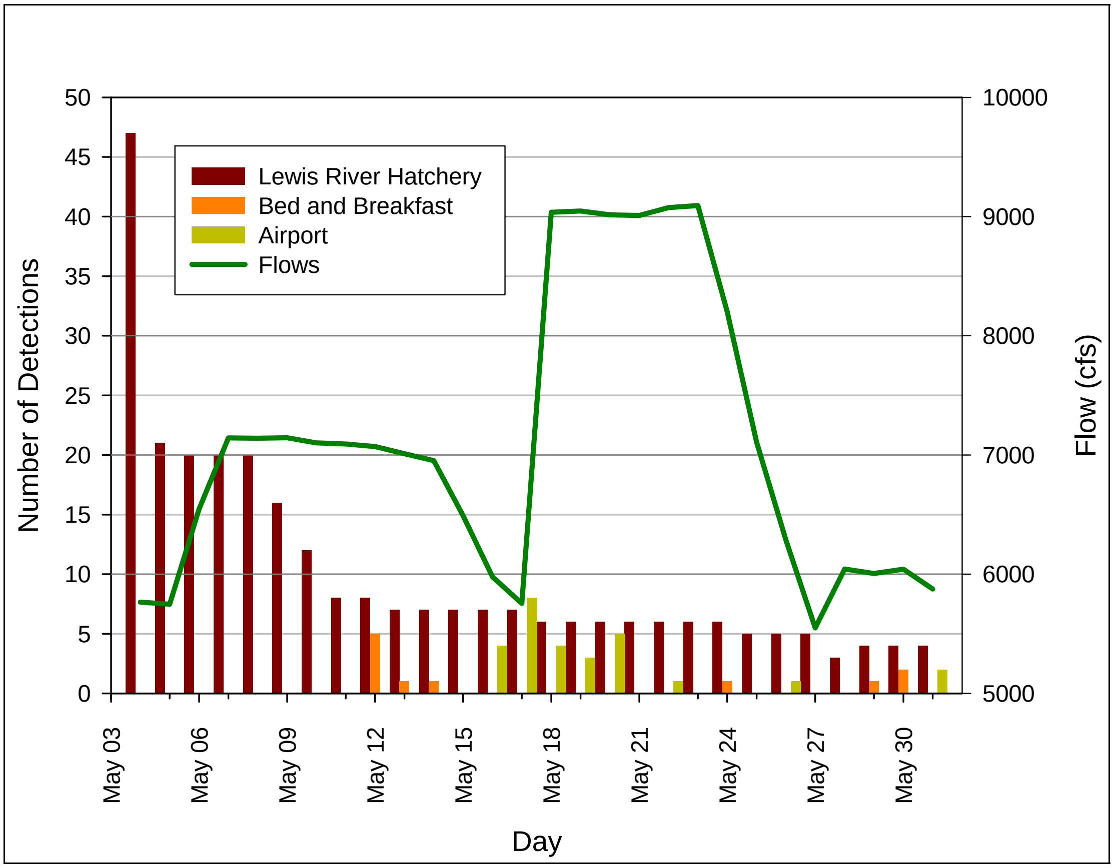

Figure 11: Number of detections by station over the period of tracking including flow levels

3.4 *Juvenile Seining*

Juvenile seining activities in 2011 were constrained by higher than normal flows. After several trips at flows in excess of 8,000 cfs it was determined that the ability to seine at flows in excess of 8,000 cfs was both time consuming and difficult. In addition, the number of sites suitable for seining (e.g. depth and flow velocities) were limited. Ideally, flows should be less than 5,000 cfs to provide the ability to seine the main current and to be effective at capturing outmigrating smolts.

To provide suitable seines for various conditions and locations the company purchased three different types of beach seines. The types purchased are shown below:

1. 50 feet long, 5/16 inch continuous mesh, 6 feet deep stick seine

2. 100 feet long, 6 feet deep beach seine. 50 foot bag @ 7/16 inch mesh size; 25 foot wings at 9/16 inch mesh size.
3. 130 feet long, 6 feet deep beach seine. 60 foot bag @ ½ inch mesh size; 35 foot wings at 5/8 inch mesh size.

Six trips were successfully made between April 29 and June 24 (Table 6). The most productive seining sites are illustrated in Figure 12. A total of 185 fish were captured (Figure13 and 14). Of these, 27 were gastric lavaged to determine stomach contents and note the presence of fry (Table 7). Forty-four percent (n=9) of the cutthroat lavaged had fry in their stomachs. One fish stomach contained 6 fry! The presence of fry in the stomachs of hatchery and wild steelhead was eighteen and fourteen percent, respectively (Table 7). All fish observed from lavaging were not identified to species but were positively identified as salmonid fry and assumed to be fall Chinook based on size and shape. Maximum, minimum and average fork lengths of all fish captured are provided in Figure 13.

Table 6: Number of fish caught and number of seining events in 2011

Date	Flow (cfs)	No. of Fish Caught
April 29, 2011	5770	46
May 3, 2011	5780	64
May 10, 2011	7080	1
May 17, 2011	8700	67
May 26, 2011	5850	7
June 24, 2011	4200	0

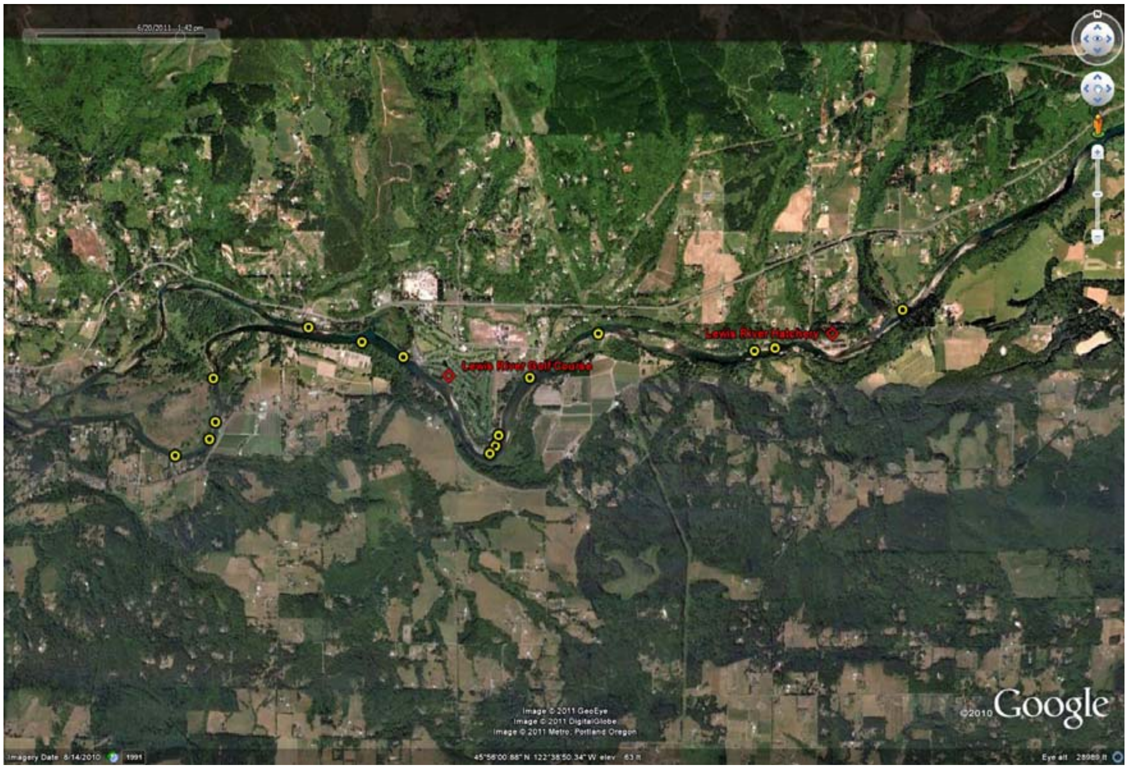

Figure 12: Location of seining sites in 2011

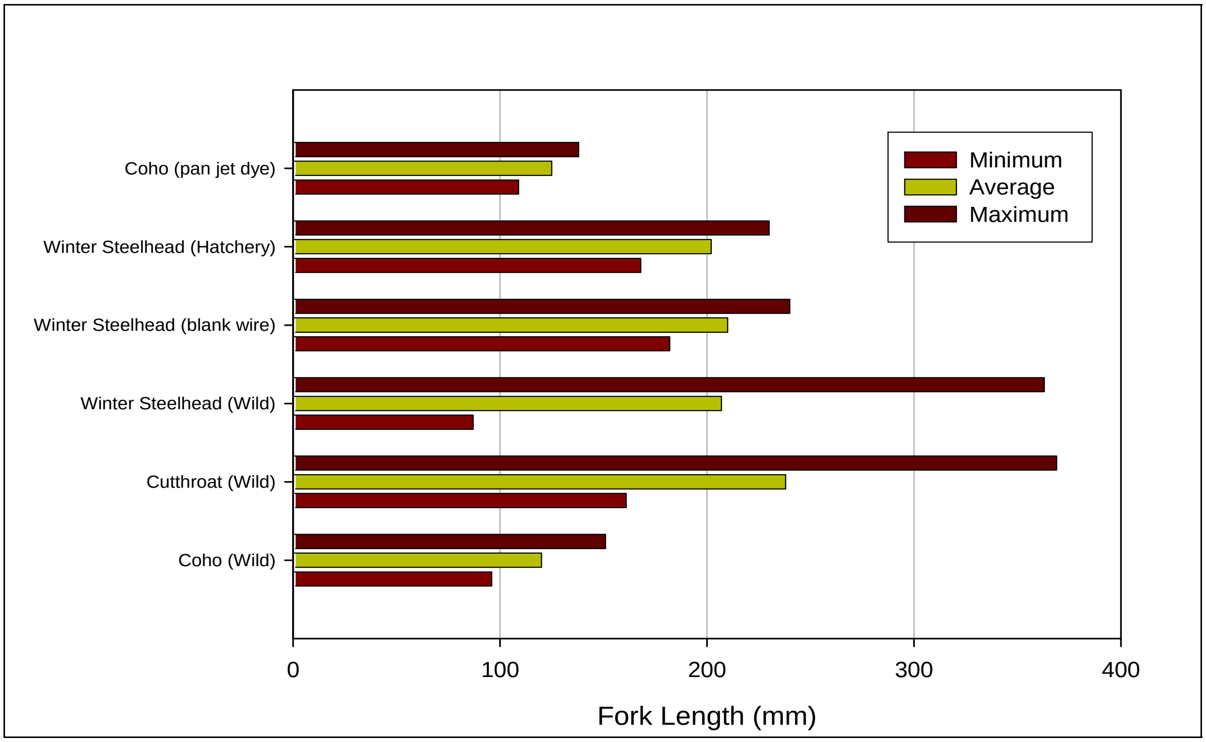

Figure 13: Length of fish caught by species during seining activities in 2011

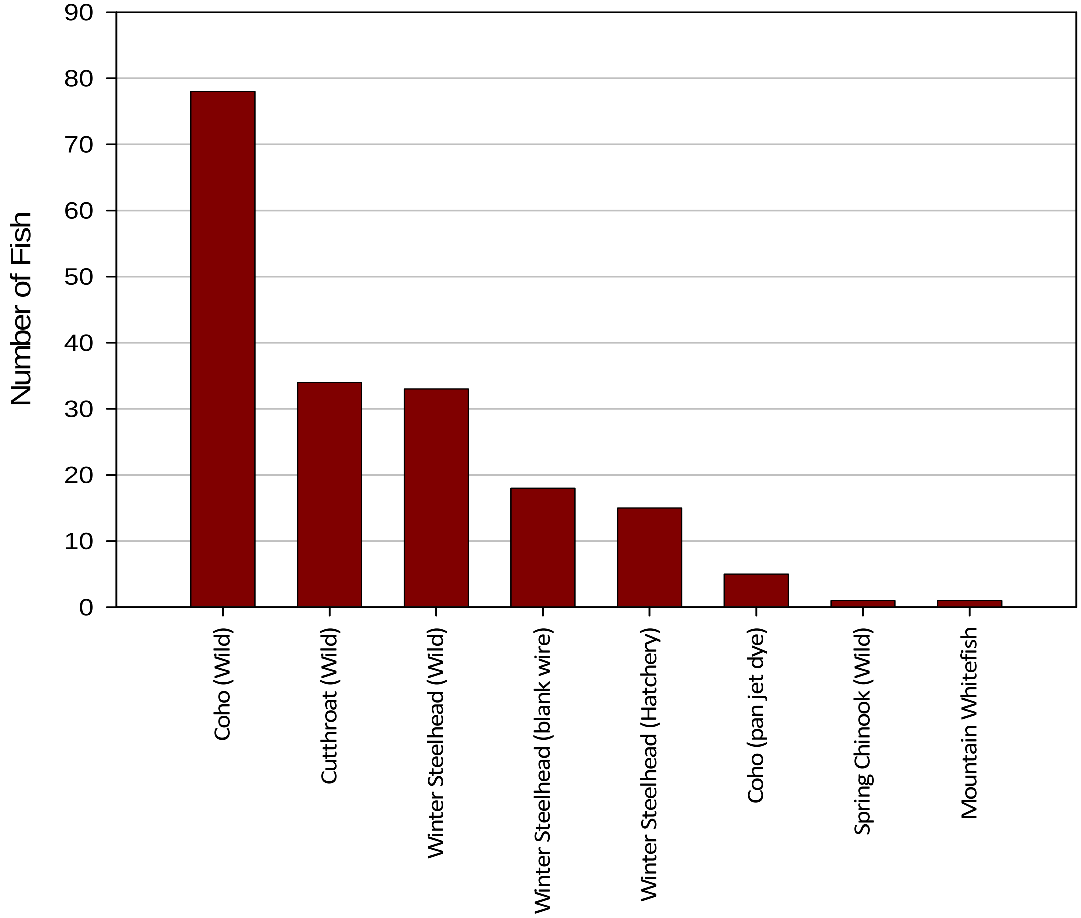

Figure 14: Number of fish caught by species from seining activities

Table 7: Results of fish lavaged during seining activities

DATE	SPECIES	FL (mm)	Fish Presence	Fl of ingested fish
April 29, 2011	Steelhead (Hatchery)	211	0	
April 29, 2011	Steelhead (Hatchery)	198	0	
April 29, 2011	Steelhead (Hatchery)	196	0	
April 29, 2011	Steelhead (Hatchery)	175	0	
April 29, 2011	Steelhead (Hatchery)	170	0	
May 3, 2011	Cutthroat	369	0	
May 3, 2011	Cutthroat	362	3	33 mm
May 3, 2011	Cutthroat	339	3	33-37 mm
May 3, 2011	Cutthroat	282	6	30-40 mm
May 3, 2011	Cutthroat	208	0	
May 3, 2011	Cutthroat	195	0	
May 3, 2011	Cutthroat	168	0	
May 3, 2011	Cutthroat	190	0	
May 3, 2011	Steelhead (Hatchery)	228	0	
May 3, 2011	Steelhead (Hatchery)	220	0	
May 3, 2011	Steelhead (Hatchery)	220	1	FCH fry
May 3, 2011	Steelhead (Hatchery)	218	0	
May 3, 2011	Steelhead (Hatchery)	214	0	
May 17, 2011	Steelhead (wild)	206	0	
May 17, 2011	Steelhead (wild)	240	0	
May 17, 2011	Steelhead (wild)	205	0	
May 17, 2011	Steelhead (wild)	209	0	
May 17, 2011	Steelhead (wild)	215	0	
May 17, 2011	Steelhead (Hatchery)	230	1	33 mm
May 17, 2011	Steelhead (wild)	210	0	
May 17, 2011	Steelhead (wild)	204	1	30 mm
May 17, 2011	Cutthroat	239	3	35-40 mm

3.5 Mainstem Carcass Surveys

3.5.1 Spring Chinook – No information provided by WDFW

3.5.2 Coho Salmon

Appendix I provides a preliminary technical memo from Dan Rawding to Bryce Glaser summarizing abundance estimates of early and late coho for 2011 based on carcass recoveries. To summarize, the mean estimate for both early and late coho was 4,054 (CI = 2,813 to 6,228 at the 95% CL) . Of this, 2,882 were hatchery origin spawners (HOS) and 1,172 were of natural origin (NOS).

3.6 Tributary Carcass Surveys (coho salmon)- No information provided by WDFW

4.0 Recommendations for ongoing management

Improvement in efficiency and coordination continue to be implemented as the HSS learns more about the components of this program. The most labor intensive aspects of the program include the collection, spawning and rearing of wild winter steelhead and implementation of the monitoring and evaluation for in river and tributary surveys. Compared to our first year of implementation in 2009, several improvements were implemented in 2010 and 2011 including improved collection efficiency for in-river netting of steelhead, genetic analysis turnaround time, logistics, and reductions in rearing mortalities. There are still many things we could improve upon and we will continue to monitor, measure and correct issues as they develop to improve efficiency and reduce stress on species used as part of the reintroduction program. The changes we made in 2011 as well as ongoing issues or concerns are provided in Appendix J. This list will continue to be updated on an annual basis as part of this report and plan. This will ensure that we don't lose sight of continually improving this effort for the betterment of the species involved.

5.0 References

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Appendix A - Wild Winter Steelhead Collection Log

APPENDIX A: Broodstock Collection Data Log

Trap Date	Sample Date	Capture Method	Gender	Fork Length (cm)	Pit Tag #	DNA Sample #	DNA Results (% assignment)	Returned To River	Maturity	MS 222 Y or N	Other Marks Y or N	Comments
12/21/2010	12/21/2010	Merwin Trap	M	NA	53FBAD4	1	.9933 Cowlitz River Hatchery	Island Boat Ramp		Y	N	Not Holding for Brood Until Jan. 24, 2011
12/21/2010	12/21/2010	Merwin Trap	M	NA	53FD678	2	0.9975 LR Hatchery Winter	Island Boat Ramp		Y	N	Not Holding for Brood Until Jan. 24, 2011 / Recaptured 12/28/10
12/22/2010	12/22/2010	Merwin Trap	F	NA	53FBEE6	3	.7254 N.F. Toutle Hatchery	Island Boat Ramp		Y	N	Not Holding for Brood Until Jan. 24, 2011
12/22/2010	12/22/2010	Merwin Trap	F	NA	53FF26E	4	.9999 Kalama Summer	Island Boat Ramp		Y	N	Not Holding for Brood Until Jan. 24, 2011 / Recaptured 12/30/10
12/22/2010	12/22/2010	Merwin Trap	F	NA	53FBEFC	5	.9292 Kalama Hatchery	Island Boat Ramp		Y	N	Not Holding for Brood Until Jan. 24, 2011 / Recaptured 12/28/10
1/6/2011	1/6/2011	Merwin Trap	F	NA	87E3DFE	6	.9998 LR Hatchery Winter	Island Boat Ramp		Y	N	Not Holding for Brood Until Jan. 24, 2011
1/26/2011	1/26/2011	Merwin Trap	F	77	53FD6B2	7	.4385 Germany Creek	Island Boat Ramp		Y	N	scale card #8162
1/26/2011	1/26/2011	Merwin Trap	M	79	87E418B	8	.5671 LR Hatchery Winter	Killed		Y	N	scale card #8161
1/26/2011	1/26/2011	Merwin Trap	F	82	53FCA05	9	.4691 Cedar Creek	Island Boat Ramp		Y	N	scale card #8162
1/26/2011	1/26/2011	Merwin Trap	M	91	53FF591	10	.7311 GrRLC	Island Boat Ramp		Y	N	scale card #8162
1/26/2011	1/26/2011	Merwin Trap	M	56	53FB87C	11	.9999 Klickitat Summer	Island Boat Ramp		Y	N	scale card #8162
1/26/2011	1/26/2011	Tangle Net	F	47	53FB41B	12	.9671 Germany Creek	Island Boat Ramp		Y	N	Pacificorp LRB34, scale card#8162
1/27/2011	1/27/2011	Merwin Trap	F	77	53FDCE1	13	.7948 Lewis River	Brood		Y	N	scale card #8162, 4/18/11 Spawned w/ male # 31 and #35
1/31/2011	1/31/2011	Merwin Trap	F	60	53FF5D0	14	.8946 Kalama Falls Hatchery	Island Boat Ramp	Ripe	Y	N	Released 1/31/11 before genetic results, scale card 38162
1/31/2011	1/31/2011	Merwin Trap	M	92	53FBB2A	15	.5684 Lewis River	Brood		Y	N	scale card #8162, 4/15/11 Spawned w/ Female #34
2/2/2011	2/2/2011	Tangle Net	M	67	53FF5C2	16	.9552 GrLCR	Island Boat Ramp		Y	N	Pacificorp LRB37, scale card#8162
2/8/2011	2/8/2011	Tangle Net	F	67	53FD900	17	.5168 Clackamas	Island Boat Ramp		Y	N	LRB 38
2/16/2011	2/16/2011	Tangle Net	M	94	D4C2	18	.8741 Germany Creek	Island Boat Ramp		N	N	LRB 40
3/1/2011	3/1/2011	Tangle Net	F	81	F53E	19	.5352 Merwin	Merwin Boat Ramp		N	N	LRB 41. Brood fish in poor condition Released 3/29/11
3/2/2011	3/2/2011	Tangle Net	M	66	E9BC	20	.8829 Germany Creek	Island Boat Ramp		N	N	LRB 42
3/8/2011	3/8/2011	Tangle Net	M	86	BFE9	21	.5159 Mill Creek	Island Boat Ramp		N	N	LRB 43
3/22/2011	3/22/2011	Tangle Net	F	88	7E4161	22	0.5369 Cedar Creek	Brood	Ripe	N	N	LRB 45. 4/1/11 Spawned w / Male #25 and #26
3/22/2011	3/22/2011	Tangle Net	M	74	7E4017	23	0.5176 Cedar Creek	Brood		N	N	LRB 46, 4/28/11 Spawned w/ Female #36 and #65
3/22/2011	3/22/2011	Tangle Net	M	54	7E3EC3	24	0.5094 Merwin	Brood		N	N	LRB 47, 4/25/11 Spawned w/ Female #39,43,44
3/22/2011	3/22/2011	Tangle Net	M	77	87E4010	25	0.7105 Cedar Creek	Brood		N	N	WDFW #1. 4/1/11 Spawned w/ Female #22
3/22/2011	3/22/2011	Tangle Net	M	72	87E3F9A	26	.727 Cedar Cr. / N.F Lewis	Brood		N	N	WDFW #2. 4/1/11 Spawned w/ Female #22
3/23/2011	3/23/2011	Tangle Net	F	69	7E3F4C	27	0.9194 Cedar Creek	Brood		N	N	LRB 48 no scales, 4/18/11 Spawned w/ male # 31 and #35
3/23/2011	3/23/2011	Tangle Net	M	64	7E3F51	28	0.6235 Cedar Creek	Brood		N	N	LRB 49, 4/28/11 Spawned w/ Female #36 and #65
3/23/2011	3/23/2011	Tangle Net	M	87	7E4114	29	.9326 Cedar Creek	Brood		N	N	LRB 50 no scales, Spawned w/ Female #34
3/23/2011	3/23/2011	Tangle Net	M	55	7E4038	30	0.9914 Cedar Creek	Brood		N	N	LRB 51 no scales, 5/2/11 Spawned w/ Female #68
3/29/2011	3/29/2011	Tangle Net	M	78	7E3E48	31	0.9498 Cedar Creek	Brood		N	N	LRB 52, 4/18/11 Spawned w/ Female # 13 and #27
3/29/2011	3/29/2011	Tangle Net	M	56	7E41C4	32	0.9853 Cedar Creek	MORT		N	N	LRB 53, 4/25/11 Mortality
4/5/2011	4/5/2011	Tangle Net	M	53	E4167	33	.7321 Grays River	Island Boat Ramp		N	N	LRB 54
4/5/2011	4/5/2011	Tangle Net	F	82	E40FE	34	.5092 Cedar Creek	Brood		N	N	LRB 55 4/15/11 Spawned w/ Male # 15 and # 29
4/5/2011	4/5/2011	Tangle Net	M	63	E40E1	35	.8672 Merwin	Brood		N	N	LRB 56, 4/18/11 Spawned w/ Female # 13 and #27
4/5/2011	4/5/2011	Tangle Net	F	82	E3E62	36	.9538 Sandy River	Brood		N	N	LRB 57, 4/28/11 Spawned w/ Male #23 and #28
4/5/2011	4/5/2011	Tangle Net	M	66	E4136	37	.8614 Cedar Creek	Brood		N	N	LRB 58, 4/25/11 Spawned w/ Female #39,43,44
4/5/2011	4/5/2011	Tangle Net	M	65	53FCCE2	38	.985 Cedar Creek	Brood		N	N	WDFW #3, 4/25/11 Spawned w/ Female #39,43,44
4/5/2011	4/5/2011	Tangle Net	F	82	53FE1BF	39	.9969 cedar Creek	Brood		N	N	WDFW #4, 4/25/11 Spawned w/ Male #24,37,38
4/5/2011	4/5/2011	Tangle Net	M	51	87E3F67	40	.6166 Cedar Creek	MORT		N	N	WDFW #5 Mortality 5/2/11
4/13/2011	4/13/2011	Tangle Net	M	93	E3F33	41	.8274 Merwin	Tangle Net Release		N	N	LRB 59
4/13/2011	4/13/2011	Tangle Net	M	76	E3EF6	42	.8037 Merwin	Tangle Net Release		N	N	LRB 60
4/13/2011	4/13/2011	Tangle Net	F	73	E4092	43	.43 Cedar Creek .36 Grays River	Brood		N	N	LRB 61, 4/25/11 Spawned w/ Male #24,37,38
4/13/2011	4/13/2011	Tangle Net	F	84	E3EE7	44	.41 Kalama .23 Green River	Brood		N	N	LRB 62, 4/25/11 Spawned w/ Male #24,37,38
4/13/2011	4/13/2011	Tangle Net	M	40	E401C	45	.33 Cedar Creek .30 Merwin	Tangle Net Release		N	N	LRB 63
4/13/2011	4/13/2011	Tangle Net	M	41	E40A1	46	.8823 Merwin	Tangle Net Release		N	N	LRB 64
4/13/2011	4/13/2011	Tangle Net	M	70	E3FA1	47	.5959 Cedar Creek	Tangle Net Release		N	N	LRB 65
4/13/2011	4/13/2011	Tangle Net	M	51	E3ED8	48	.8257 Green River	Tangle Net Release		N	N	LRB 66
4/13/2011	4/13/2011	Tangle Net	M	62	E3F29	49	.6003 Merwin	Tangle Net Release		N	N	LRB 67
4/13/2011	4/13/2011	Tangle Net	F	79	E3E72	50	.8218 Cedar Creek	Brood		N	N	LRB 68, 5/12/11 Spawned w/ Male #62
4/15/2011	4/15/2011	Merwin Trap	M	63	53FD12B	51	.5786 Cedar Creek	Island Boat Ramp		Y	N	Released 5/12/11
4/18/2011	4/18/2011	Merwin Trap	M	70	53FBF31	52	.5601 Merwin	Island Boat Ramp		Y	N	Released 5/12/11

Trap Date	Sample Date	Capture Method	Gender	Fork Length (cm)	Pit Tag #	DNA Sample #	DNA Results (% assignment)	Returned To River	Maturity	MS 222 Y or N	Other Marks Y or N	Comments
4/19/2011	4/19/2011	Merwin Trap	M	76	53FCC71	53	.5967 Cedar Creek	MORT		Y	N	Jump Out Mortality 4/20/11
4/18/2011	4/18/2011	Tangle Net	F	72	87E4137	54	.6385 Cedar Creek	MORT				wdfw #6 5/12/11 Mortality
4/18/2011	4/18/2011	Tangle Net	M	61	53FF198	55	.9684 Cedar Creek	Island Boat Ramp				wdfw #7, Released 5/12/11
4/18/2011	4/18/2011	Tangle Net	M	57	87E41CF	56	.7711 Gemany Creek	Island Boat Ramp				wdfw #8
4/18/2011	4/18/2011	Tangle Net	M	80	87E3F64	57	Creek .2152 Merwin	Island Boat Ramp				wdfw #9
4/18/2011	4/18/2011	Tangle Net	M	59	87E418D	58	.6187 EF Lewis	Island Boat Ramp				wdfw #10
4/18/2011	4/18/2011	Tangle Net	M	77	87E3EFD	59	.9697 Merwin	Island Boat Ramp				wdfw #11 , Released 5/12/11
4/18/2011	4/18/2011	Tangle Net	M	54	53FF553	60	.3672 Germany Creek	Island Boat Ramp				wdfw #12
4/18/2011	4/18/2011	Tangle Net	M	77	87E40A4	61	.9564 Cedar Creek	Brood				wdfw #13, 5/2/11 Spawned w/ Female #68
4/18/2011	4/18/2011	Tangle Net	M	63	87E407A	62	.6728 Merwin	Brood				wdfw #14, 5/12/11 Spawned w/ Female #50
4/18/2011	4/18/2011	Tangle Net	M	62	53FF4D6	63	.9472 Cedar Creek	MORT				wdfw #15 Mortality 5/10/11
4/18/2011	4/18/2011	Tangle Net	M	53	87E3EAC	64	.39 Lewis River .37 Cedar creek	Island Boat Ramp				wdfw #16
4/19/2011	4/19/2011	Tangle Net	F	96	87E4001	65	.5352 Lewis River	Brood				wdfw #20, 4/28/11 Spawned w/ Male #23 and #28
4/19/2011	4/19/2011	Tangle Net	F	81	87E415A	66	.9596 Lewis River	Brood				wdfw #21 , 5/12/11 Spawned w/ Male #67, 75, OR29
5/2/2011	5/2/2011	Merwin Trap	M	72	53FCA23	67	.9817 Lewis River	Brood				5/12/11 Spawned w/ Female #66, 74, OR31
5/2/2011	5/2/2011	Merwin Trap	F	86	NA	68	.8502 Lewis River	Brood				5/2/11 Spawned w/ Male #30 and #61
4/20/2011	4/20/2011	Tangle Net	M	80	87E404E	69	.3501 Cedar Creek, .1459 Merwin	Tangle Net Release				wdfw #17
4/20/2011	4/20/2011	Tangle Net	M	79	87E3EBA	70	.9872 Lewis River	Tangle Net Release				wdfw #18
4/20/2011	4/20/2011	Tangle Net	M	90	87E4OD5	71	.7023 Grays River	Tangle Net Release				wdfw #19
4/20/2011	4/20/2011	Tangle Net	M	58	87E4120	72	.98 Lewis River	Tangle Net Release				wdfw #22
5/5/2011	5/5/2011	Merwin Trap	M	80	53FF54B	73	.8076 Kalama Summer	Island Boat Ramp				
5/4/2011	5/4/2011	Tangle Net	F	81	53FF588	74	.4433 Merwin, .4161 Cedar Creek	Brood				wdfw #23, 5/12/11 Spawned w/ Male #67, 75, OR29
5/4/2011	5/4/2011	Tangle Net	M	87	53FDC24	75	.9821 Merwin	Brood				wdfw #24, 5/12/11 Spawned w/ Female #66, 74, OR31
5/4/2011	5/4/2011	Tangle Net	M	85	87E3E3F	76	Sandy, .2227 Merwin	Island Boat Ramp				wdfw #25
5/4/2011	5/4/2011	Tangle Net	M	68	87E3E36	77	.9059 Merwin, .0476 LRhatchW	Tangle Net Release				wdfw #26
5/4/2011	5/4/2011	Tangle Net	M	41	87E3E91	78	.7357 Merwin	Tangle Net Release				wdfw #27
5/5/2011	5/5/2011	Tangle Net	M	81		79	.9476 Merwin	Tangle Net Release				LRB 69 In-River release
5/5/2011	5/5/2011	Tangle Net	M	51	D3FEF	80	.6822 Merwin	Tangle Net Release				LRB 70 In-River Release, wanded negative
5/5/2011	5/5/2011	Tangle Net	M	52	E41C0	81	.9543 Coweeman	Brood				LRB 71, 5/12/11 Spawned w/ Female #66, 74, OR31
5/5/2011	5/5/2011	Tangle Net	M	55	E3FF8	82	.6451 Cedar	Island Boat Ramp				LRB 72, Release 5/24/11
5/5/2011	5/5/2011	Tangle Net	F	77	E4051	83	.379 Cedar Creek, .1649 Merwin	Brood				LRB 73, 5/12/11 Spawned w/ Male #67, 75, OR29
5/16/2011	5/16/2011	Merwin Trap	F	76	NA	84	.7398 Cedar Creek	Brood				5/16/11 Spawned w/ Male #86 and 87
5/16/2011	5/16/2011	Merwin Trap	F	68	NA	85	.9591 Merwin	Brood				5/16/11 Spawned w/ Male #86 and 87
5/16/2011	5/16/2011	Merwin Trap	M	86	NA	86	.8692 Merwin	Brood				5/16/11 Spawned w/ Female #84 and 85
5/16/2011	5/16/2011	Merwin Trap	M	74	NA	87	.5893 Merwin	Brood				5/16/11 Spawned w/ Female #84 and 85
5/31/2011	5/31/2011	Merwin Trap	M	71	53FE7F6	88	.08756 LRMerwin	Island Boat Ramp				
5/31/2011	5/31/2011	Tangle Net	M	64	87E414D	89	.7533 LRMerwin	Island Boat Ramp				
5/31/2011	5/31/2011	Tangle Net	M	59	87E3EBD	90	.6716 LRMerwin	Island Boat Ramp				

Color Key		
	(light green)	Spawned, Broodstock
	(red)	Mortality
	(yellow)	Returned to River
	(blue)	Lethally Removed

Appendix B - Genetic Assignment Results from Lewis River Captures - 2011

APPENDIX B: Genetic Assignment Results from Lewis River Captures - 2011

ID	Primary	Probability	Secondary	Prob.	Tertiary	Prob.
1	CowlitzR	0.9933				
2	LRhatW	0.9975				
3	NFToutR	0.7254	MillCr	0.1767	KalamSu	0.0597
4	KalamSu	0.9999				
5	KalmFHat	0.9292	LRhatW	0.0645		
6	LRhatW	0.9998				
7	GermCr	0.4385	LRMerwn	0.402	LRCedar	0.1543
8	LRhatW	0.5671	GermCr	0.1713	MillCr	0.1454
9	LRCedar	0.4691	MillCr	0.3903	GrRLC	0.086
10	GrRLC	0.7311	LRCedar	0.1849	KalamSu	0.0628
11	KlickSu	0.9999				
12	GermCr	0.9671	MillCr	0.018	LRMerwn	0.0084
13	LRMerwin	0.7948	MillCr	0.1676	GrRLC	0.0195
14	KalmFHat	0.8946	LRhatW	0.0989		
15	LRMerwin	0.5684	LRCedar	0.4286		
16	GrRLC	0.9552	LRCedar	0.0348	0.0348	
17	Clack	0.5168	LRMerwin_wild	0.2905	LRCedar	0.1703
18	GermCr	0.8741	LRCedar	0.1118	LRMerwin	0.0065
19	LRMerwin	0.5352	MillCr	0.2645	LRCedar	0.1035
20	GermCr	0.8829	LRCedar	0.1151		
21	MillCr	0.5159	KalamSu	0.2696	LRMerwin	0.1755
22	LRCedar	0.5369	LRMerwin	0.3767	KalamW	0.0742
23	LRCedar	0.5176	SandyR	0.3278	GermCr	0.0991
24	LRMerwin	0.5094	LRCedar	0.4882		
25	LRCedar	0.7105	LRMerwin	0.2886		
26	LRCedar	0.4307	LRMerwin	0.2963	GermCr	0.2339
27	LRCedar	0.9194	LRMerwin	0.0639	GrRLC	0.0064
28	LRCedar	0.6235	KalamW	0.1699	LRMerwin	0.0912
29	LRCedar	0.9326	KalamSu	0.0349	LRMerwin	0.0201
30	LRCedar	0.9914				
31	LRCedar	0.9498	SandyR	0.0223	GermCr	0.0148
32	LRCedar	0.9853	LRMerwin	0.0123		
33	GarysR	0.7321	LRCedar	0.1185	SandyR	0.075
34	LRCedar	0.5092	LRMerwin	0.4641	Cowman	0.0199
35	LRMerwin	0.8672	LRCedar	0.1316		
36	SandyR	0.9538	Cowman	0.028	GermCr	0.0092
37	LRCedar	0.8614	LRMerwin	0.0977	GrRLC	0.0278
38	LRCedar	0.985	LRMerwin	0.0118		
39	LRCedar	0.9969				
40	LRCedar	0.6166	LRMerwin	0.382		
41	LRMerwin	0.8274	LRCedar	0.1441	GrRLC	0.022
42	LRMerwin	0.8037	GermCr	0.1579	GrRLC	0.0189
43	LRCedar	0.4328	GraysR	0.3564	LRMerwin	0.1262
44	KalamW	0.4139	GrRLC	0.234	MillCr	0.1549
45	LRCedar	0.3328	LRMerwin	0.2979	GrRLC	0.241
46	LRMerwin	0.8823	GermCr	0.0812	KalamSu	0.0214
47	LRCedar	0.5959	GermCr	0.2229	LRMerwin	0.0704
48	GrRLC	0.8257	GermCr	0.1197	LRCedar	0.033
49	LRMerwin	0.6003	Cowman	0.2025	LRCedar	0.1768
50	LRCedar	0.8218	KalamW	0.065	GermCr	0.0409
51	LRCedar	0.5786	LRMerwin	0.397	KalamW	0.0098

ID	Primary	Probability	Secondary	Prob.	Tertiary	Prob.
52	LRMerwin	0.5601	LRCedar	0.3321	Cowman	0.0519
53	LRCedar	0.5967	LRMerwin	0.3895	Cowman	0.0074
54	LRCedar	0.6385	LRMerwin	0.327	GrRLC	0.0317
55	LRCedar	0.9684	LRMerwin	0.0247		
56	GermCr	0.7711	LRCedar	0.1316	LRMerwin	0.095
57	LRCedar	0.4914	GermCr	0.2259	LRMerwin	0.2152
58	EFLewisR	0.6187	LRhatW	0.1326	GermCr	0.0758
59	LRMerwin	0.9697	Cowman	0.0176	LRCedar	0.0126
60	LRCedar	0.4525	GermCr	0.3672	GraysR	0.064
61	LRCedar	0.9564	LRMerwin	0.0196	GermCr	0.0131
62	LRMerwin	0.6728	LRCedar	0.3222		
63	LRCedar	0.9472	LRMerwin	0.0237	GraysR	0.0195
64	LRMerwin	0.3902	LRCedar	0.3698	LRhatW	0.1948
65	LRMerwin	0.5352	LRCedar	0.4298	GermCr	0.0304
66	LRMerwin	0.9596	EFLewisR	0.0141	KalamW	0.0086
67	LRMerwin	0.9817	LRCedar	0.0141		
68	LRMerwin	0.8502	LRCedar	0.1336	GarysR	0.0123
69	GraysR	0.3816	LRCedar	0.3501	LRMerwin	0.1459
70	LRMerwin	0.9872	Cowman	0.0068		
71	GraysR	0.7023	EFLewisR	0.2275	LRCedar	0.0325
72	LRMerwin	0.9842	LRCedar	0.0111		
73	KalamSu	0.8076	KalamW	0.0954	LRCedar	0.0334
74	LRMerwin	0.4433	LRCedar	0.4161	GrRLC	0.0693
75	LRMerwin	0.9821	LRCedar	0.0119		
76	GermCr	0.2458	SandyR	0.2334	LRMerwin	0.2227
77	LRMerwin	0.9059	LRhatW	0.0476	KalamW	0.0203
78	LRMerwin	0.7357	LRCedar	0.2471	Cowman	0.0169
79	LRMerwin	0.9476	LRCedar	0.0493		
80	LRMerwin	0.6822	KalamW	0.1132	SandyR	0.0518
81	Cowman	0.9543	LRMerwin	0.0298	LRCedar	0.0158
82	LRCedar	0.6451	LRMerwin	0.2951	Cowman	0.0226
83	LRCedar	0.379	LRMerwin	0.1649	GermCr	0.1595
84	LRCedar	0.7398	EFLewisR	0.0951	KalamW	0.0903
85	LRMerwin	0.9591	LRCedar	0.0236	ElochR	0.0168
86	LRMerwin	0.8692	LRCedar	0.1088	EFLewisR	0.0102
87	LRMerwin	0.5893	LRCedar	0.2409	SandyR	0.1006
88	LRMerwin	0.8756	Cowman	0.0533	LRCedar	0.0417
89	LRMerwin	0.7533	LRCedar	0.1826	GermCr	0.0384
90	LRMerwin	0.6716	LRCedar	0.2807	GrRLC	0.0161

Appendix C - Genetic Assignment Results from Cedar Creek Captures - 2011

APPENDIX C: Genetic Assignment Results from Cedar Creek Captures - 2011

ID	Primary	Prob	Secondary	Prob	Tertiary	Prob
1	GrRLC	0.356	GermCr	0.23	LRCedar	0.2019
2	LRhatW	0.728	LRCedar	0.2095	GrRLC	0.0555
3	LRCedar	0.9519	GermCr	0.0347	LRMerwin	0.0065
4						
5	LRCedar	0.9571	Cowman	0.0198	LRMerwin	0.0178
6	KalamW	0.7187	GermCr	0.2022	LRCedar	0.0382
7	LRCedar	0.8967	LRhatW	0.0526	GermCr	0.047
8	LRCedar	0.9027	GermCr	0.0968		
9	LRCedar	0.5929	GrRLC	0.2223	GermCr	0.1203
10	LRCedar	0.7732	LRhatW	0.1349	GermCr	0.0443
11	LRCedar	0.9529	GrRLC	0.039		
12	LRCedar	0.9116	LRMerwin	0.0687	Cowman	0.0197
13	LRCedar	0.9596	LRMerwin	0.0219	GermCr	0.0169
14	LRCedar	0.942	GermCr	0.0266	MillCr	0.0107
15	LRCedar	0.862	LRMerwin	0.0826	KalamW	0.0238
16	GermCr	0.5486	LRCedar	0.308	LRMerwin	0.0769
17	LRCedar	0.989	KalamSu	0.0032		
18	LRhatW	0.4239	LRMerwin	0.4134	KalmFHat	0.1409
19	LRCedar	0.5688	Cowman	0.3058	GermCr	0.055
20	LRMerwin	0.9222	LRCedar	0.0573	KalamW	0.0114
21	Cowman	0.512	LRCedar	0.4277	LRMerwin	0.0305
22	LRMerwin	0.6904	LRCedar	0.2476	Cowman	0.0466
23	KalamSu	0.5897	GermCr	0.3345	LRCedar	0.0392
24	LRCedar	0.8491	GermCr	0.1139	LRMerwin	0.0197
25	LRCedar	0.8959	KalamSu	0.0455	LRMerwin	0.0305
26	LRCedar	0.3931	LRMerwin	0.306	LowNSant	0.1292
27	LRCedar	0.9714	Cowman	0.0157	GermCr	0.0064
28	LRCedar	0.832	Cowman	0.1197	LRMerwin	0.0443
29	SandyR	0.89	GermCr	0.0788	LRMerwin	0.0299
30	LRCedar	0.5454	LRMerwin	0.4208	SandyR	0.0087
31	LRCedar	0.7915	SandyR	0.1505	LRMerwin	0.0467
32	LRCedar	0.9626	LRMerwin	0.0353		
33	LRCedar	0.8874	GrRLC	0.0747	LRMerwin	0.0342
34	LRCedar	0.8522	SandyR	0.1048	KalamSu	0.0243
35						
36	LRCedar	0.8954	LRMerwin	0.0821	Cowman	0.0116
37	LowNSant	0.7552	LRCedar	0.1298	LRMerwin	0.0876
38	LRCedar	0.8722	GermCr	0.1051	LRMerwin	0.0129
39	LRCedar	0.9779	LRMerwin	0.0192		
40	LRCedar	0.8855	LRMerwin	0.1036	MillCr	0.0095
41	LRCedar	0.94	KalmFHat	0.0318	SandyR	0.0087
42	LRCedar	0.8194	SandyR	0.0492	KalmFHat	0.0485
43	LRCedar	0.7111	GrRLC	0.2708	GermCr	0.0137
44	LRCedar	0.8143	LRMerwin	0.1727	GermCr	0.0051
45	LRCedar	0.8677	GrRLC	0.0552	LRMerwin	0.0413
46	LRMerwin	0.4022	LRCedar	0.3258	GermCr	0.2069

ID	Primary	Prob	Secondary	Prob	Tertiary	Prob
47	LRCedar	0.8479	LRMerwin	0.1391	KalamW	0.0068
48	LRCedar	0.9966				
49	LRCedar	0.9178	LRMerwin	0.0284	GrRLC	0.0162
50	GermCr	0.414	LRCedar	0.3905	LRMerwin	0.0945
51	LRCedar	0.9	LRMerwin	0.0703	GermCr	0.0114
52	LRCedar	0.9406	LRMerwin	0.059		
53	LRCedar	0.9313	LRMerwin	0.0666		
54	LRCedar	0.9404	LRMerwin	0.0491	GrRLC	0.0046
55	LRCedar	0.979	GarysR	0.018		
56	LRCedar	0.8879	LRMerwin	0.1015	KalamW	0.0035
57	LRCedar	0.9856	LRMerwin	0.0116		
58	LRMerwin	0.679	SandyR	0.1837	LRCedar	0.0889
59	LRMerwin	0.3575	KalamW	0.3104	GermCr	0.1487
60	LRCedar	0.6245	LRMerwin	0.2957	KalamW	0.0653
61	LRCedar	0.4645	Cowman	0.1766	KalamW	0.1306
100	EFLewisR	0.9008	LRCedar	0.0527	KalamSu	0.0176

Appendix D - 2011 Spawning Crosses at Merwin Hatchery

APPENDIX D: 2011 SPAWNING CROSSES AT MERWIN HATCHERY

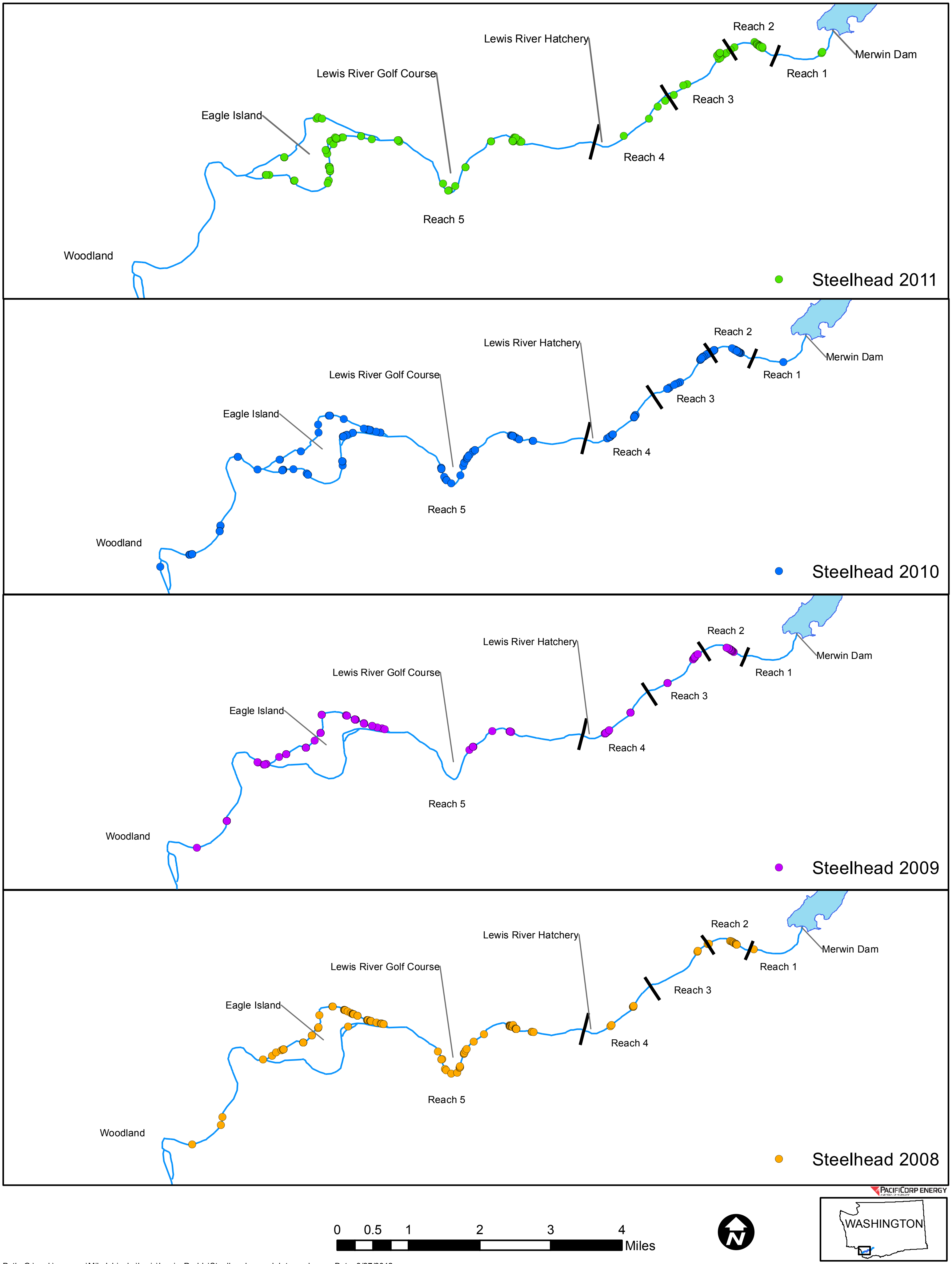
	Females			Males		
Spawn Cross	DNA No.	Primary Assignment	Percent Assignment		Primary Assignment	DNA No.
1	22	Cedar	54	71	Cedar	25
				43	Cedar	26
2	34	Cedar	51	57	N FK Lewis	15
				93	Cedar	29
3	13	N FK Lewis	79	95	Cedar	31
	27	Cedar	92	87	N FK Lewis	35
4	44	Kalama	41	51	N FK Lewis	24
	43	Cedar	43	86	Cedar	37
	39	Cedar	99	99	Cedar	38
5	36	Sandy R	95	52	Cedar	23
	65	N FK Lewis	54	62	Cedar	28
6	68	N FK Lewis	85	99	Cedar	30
				96	Cedar	61
7	50	Cedar	82	67	N FK Lewis	62
8	66	N FK Lewis	96	98	N FK Lewis	67
	74	N FK Lewis	44	98	N FK Lewis	75
	83	Cedar	38	95	Coweeman	81
9	84	Cedar	74	87	N FK Lewis	86
	85	N FK Lewis	96	59	N FK Lewis	87

Appendix E - Wild Winter Steelhead Spawning Log - 2011

APPENDIX E: Wild Winter Steelhead Spawning Log - 2011

Spawn Date	Female DNA #	Male DNA #	Live Spawn Males	Total Egg Weight w/ovarian (grams)	Eyed Egg Eggs/LB	Eyed Eggs On-Hand	Dead Eggs	Actual Eggs/Female	Percent of Egg Loss	Estimate # Fry Ponded
4/1/2011	22	25 & 26	N	1161	1829	4280	903	5183	17%	4237
4/15/2011	34	15 & 29	N	1374	2143	6558	468	7026	7%	6492
4/18/2011	13	31 & 35	N	633	NA	226	4260	4486	95%	224
4/18/2011	27	31 & 35	N	594	2724	3650	614	4264	14%	3614
4/25/2011	44	24, 37, 38	N	1167	2454	6852	50	6902	1%	6783
4/25/2011	43	24, 37, 38	N	976	2473	4773	591	5364	11%	4725
4/25/2011	39	24, 37, 38	N	990	2231	4841	869	5710	15%	4793
4/28/2011	36	23, 28	N	1024	2393	5758	47	5805	1%	5700
4/28/2011	65	23, 28	N	1271	2146	5629	455	6084	7%	5573
5/2/2011	68	30, 61	N	1170	2285	6170	92	6262	1%	6108
5/12/2011	50	62	N	1100	2863	7263	403	7666	5%	7190
5/12/2011	66	67, 75, 81	N	803	2659	4632	120	4752	3%	4586
5/12/2011	74	67, 75, 81	N	604	3269	4318	34	4352	1%	4275
5/12/2011	83	67, 75, 81	N	913	2520	5335	324	5659	6%	5282
5/16/2011	84	86, 87	N	997	2402	5669	60	5729	1%	5612
5/16/2011	85	86, 87	N	643	2768	4041	205	4246	5%	4001
					TOTAL	**79,995**	**9,495**	**89,490**		**79,195**
								Average	**11.90%**	

Appendix F - Steelhead Redd Locations 2008 - 2011



Path: G:\work\common\MikeIchisaka\lewis\Lewis_Redds\Steelhead annual data.mxd

Date: 3/27/2012

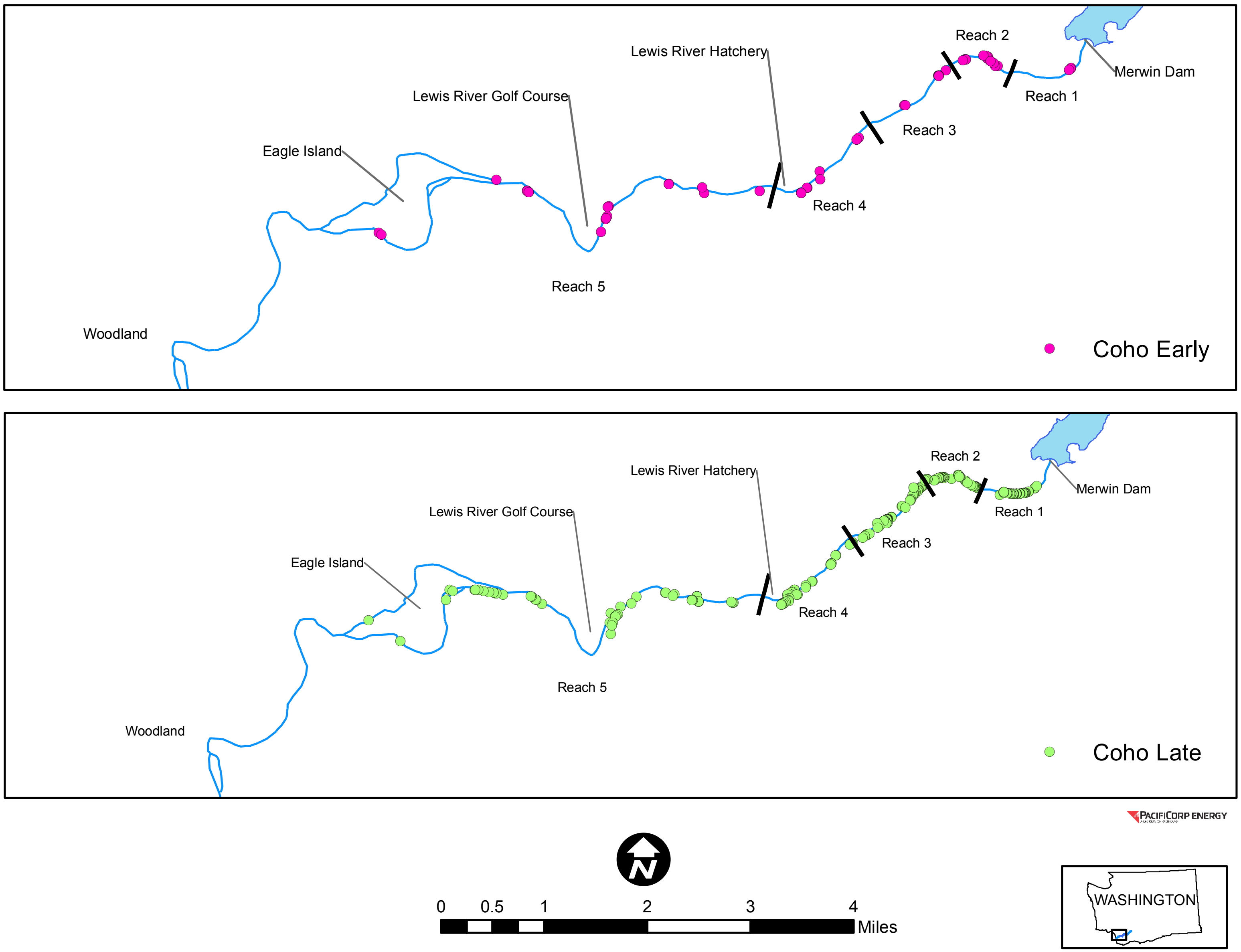
Appendix G - Coho smolt fork length and Radio Tag ID (n=50)

APPENDIX G: Tag ID codes and Fork Lengths of Coho Smolts Tagged at Lewis River Hatchery

Tag ID	Fork Lenght (mm)
11	141
12	135
13	147
14	137
15	130
16	141
17	129
18	132
19	156
20	135
21	128
22	145
23	140
24	119
25	152
26	129
27	138
28	139
29	135
30	120
31	143
32	136
33	144
34	140
35	146

Tag ID	Fork Lenght (mm)
36	138
37	153
38	130
39	135
40	137
41	137
42	149
43	136
44	136
45	132
46	141
47	126
48	132
49	126
50	129
51	133
52	134
53	141
54	146
55	140
56	148
57	145
58	130
59	144
60	125

Appendix H - Early and Late Coho Redd Location 2011



Path: G:\work\common\MikeIchisaka\lewis\Lewis_Redds\Coho data 2011.mxd Date: 3/27/2012

Appendix I - Memo from Dan Rawding to Bryce Glaser regarding Coho Abundance Estimates

February 28, 2012
To: Bryce Glaser
From: Dan Rawding
Subject: 2011 Lewis River Carcass Tagging Results for Coho Salmon

Enclosed are the preliminary results from the 2011 coho salmon carcass tagging project on the NF Lewis from Merwin Dam to Eagle Island. There were no significant differences in the recovery rate of adults by sex or origin in the second sample (alpha = 0.05). Also, there was no significant difference in the recovery rate between jacks and adults in the second sample. However, the percentage of jack carcasses was ~1% of the total carcasses sampled, which indicates there was a difference in the recovery rate of jacks and adults in the first sample. Therefore, jacks were excluded from the analysis. To estimate the proportion of Hatchery Origin Spawners (pHOS) it was assumed that all coho salmon were mass marked or CWT, all mark sampled fish were scanned for CWT, and CWT wands were 100% at detecting CWT. Since these assumptions were likely violated, the resulting estimate of pHOS and HOS is likely biased high.

Examination of the weekly abundance estimate suggests that at least two different groups of coho salmon spawned. The first and smaller group spawned through November 10. After this date there was a higher level of spawning which tapered off to a few fish by the end of January. The first group we have termed "earlies" and the second "lates". These may or may not correspond to the two hatchery stocks released from Lewis River hatchery. Table 1 provides the seasonal abundance estimates by group and Figure 1 provides the periodic estimates over the season.

This is a Bayesian analysis based on Schwarz and Arnason (1996) parameterization of the Jolly Seber model as applied to estimate salmon spawning abundance from carcass tagging (Sykes and Botsford 1986). In a Bayesian analysis, the posterior distribution is proportional to the prior distribution times the likelihood function. When the likelihood function dominates the data the results are the same as the maximum likelihood. However, since there were few recoveries in many periods, these results are influenced by the prior, which is vague. In this case many estimates of the probability of capture (p), survival (phi), and probability of entry (pent) are similar to the prior, which means they and the resulting abundance estimates are sensitive to the prior distribution chosen for the analysis.

This is evident when then the B_Star's (estimated abundance for each period) are expanded. The SD is greater than the mean for 6 of the first 7 periods, and during the last 4 periods. The estimates are much more precise from periods 8 to 12. The precision of the estimate is a function of carcass recoveries for release groups (0,1,3,2,0,0,0,26,80,121,17,6,9,0,0,0). The CV for the abundance is ~22%, which is less precise than the NOAA recommended guidance of 15%.

There are some analytical methods that could be explored to improve the precision of these estimate based on pooling similar period, hierarchical analysis of parameter estimates, examination the usefulness of covariates to explain the probability of capture or survival, and mixture modeling to explain distribution on spawning time. If these prove useful the abundance estimates will likely be reduced and the precision improved. However, I did not have time to explore these options. In addition, abundance by group (early vs. lates) can be determined by CWT codes, but these were not available at the time of analysis. Please contact me with questions!

References

Schwarz, C.J., and A.N. Arnason. 1996. A general method for analysis of capture-recapture experiments in open populations. Biometrics 52:860-873.

Sykes, S.D., and L. W. Botsford. 1986. Chinook salmon, *Oncorhynchus tshawytscha*, spawning escapement based on multiple mark-recapture of carcasses. Fish. Bull. 84:261-270.

Table 1. Preliminary results of NF Lewis adult coho salmon carcass tagging project from Merwin Dam to Eagle Island during the fall of 2011 using the Jolly-Seber model with Jefferies priors.

node	mean	sd	2.50%	median	97.50%
Nsuper	4054	891.8	2813	3868	6228
HOS	2882	602.7	2037	2761	4358
NOS	1172	322.2	730.2	1105	1956
Earlies	723.6	405.2	267.6	613.2	1803
Lates	3330	749.8	2334	3162	5193
NOS_Early	299.1	173.5	104.7	252.4	767.8
NOS_Late	872.7	256	537.5	815	1533
HOS_Early	424.5	242.8	152.2	358.2	1077
HOS_Late	2457	524.9	1753	2344	3732

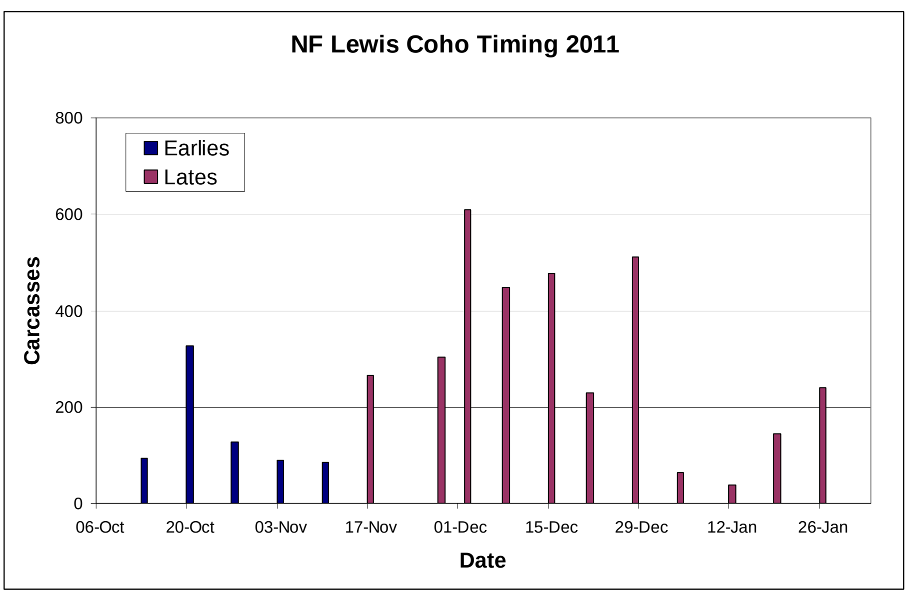


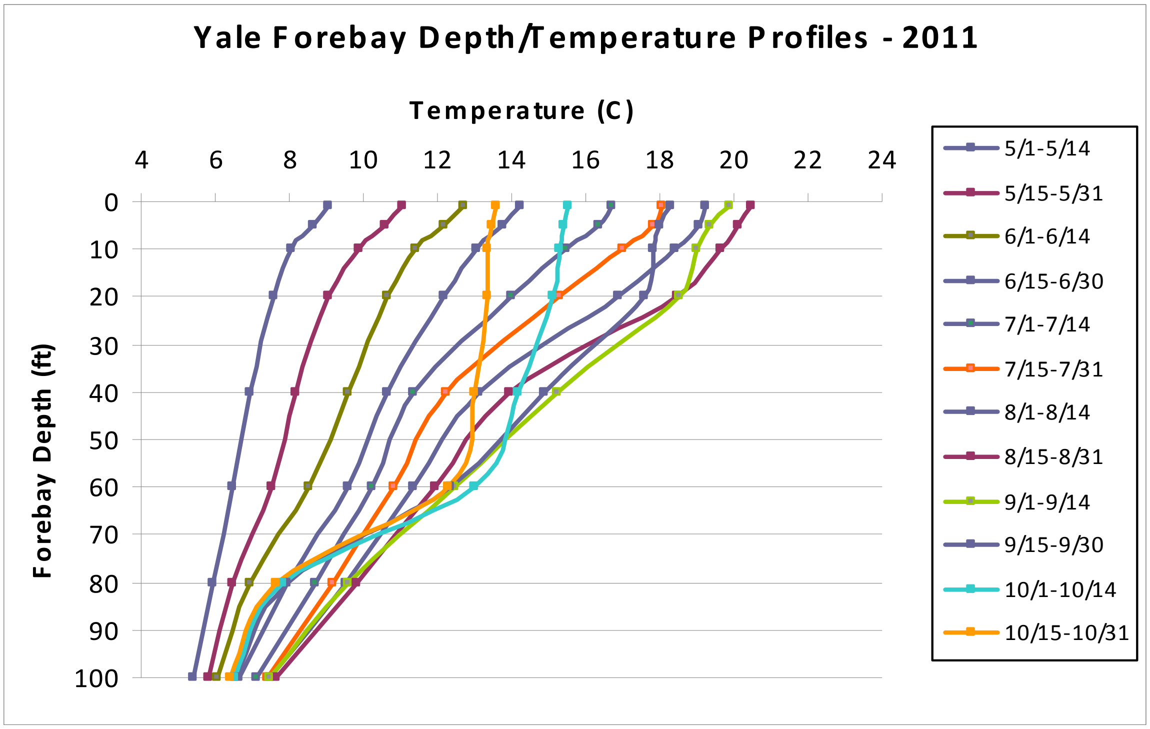
Figure 1. Periodic carcass abundance estimates for NF Lewis coho salmon during 2011.

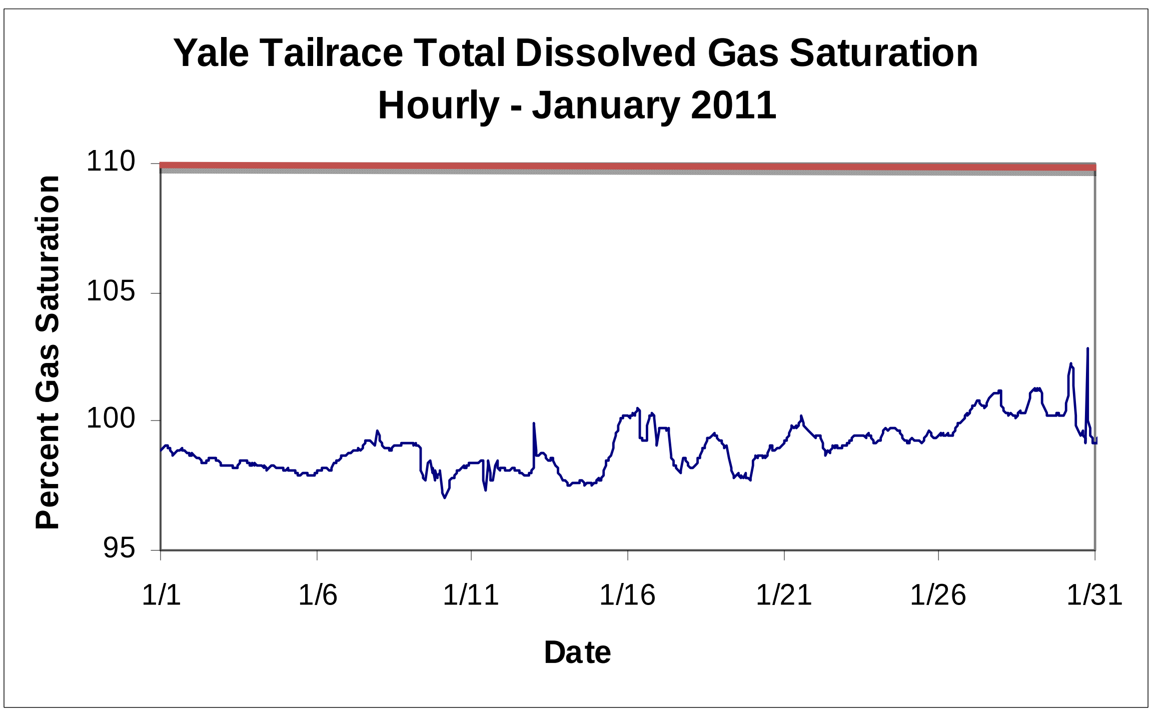
Appendix J - Summary and Status of Recommendations Identified for Implementation

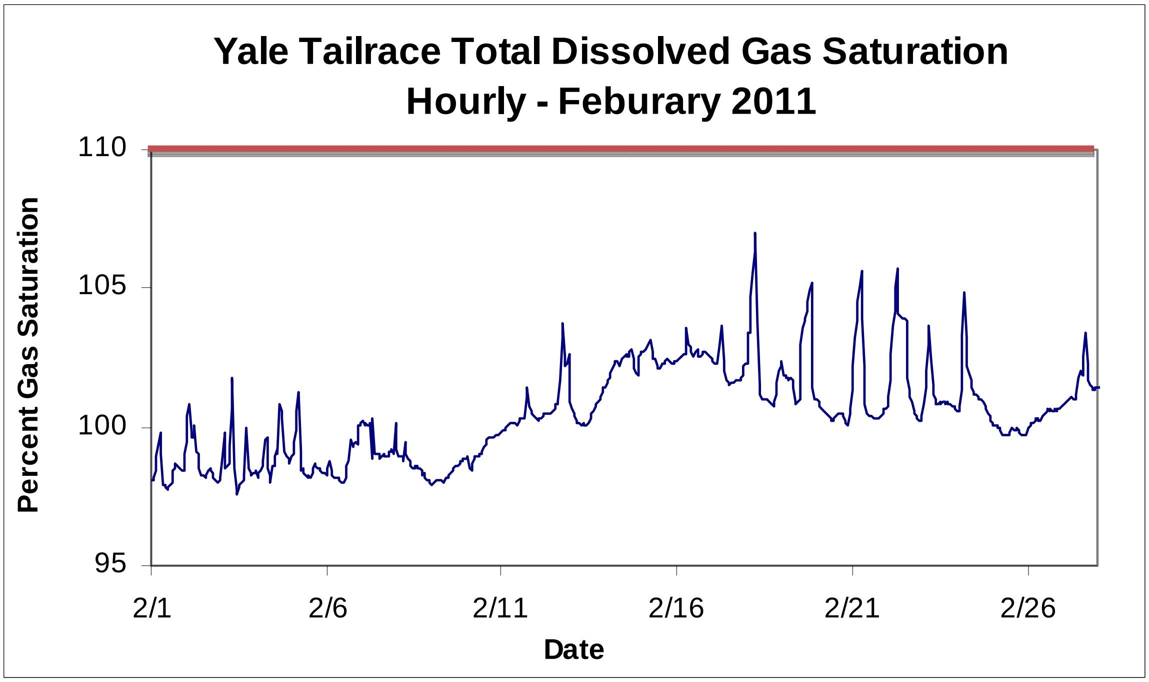
APPENDIX J: Summary and Status fo Recommendations Identified for Implementation in 2011

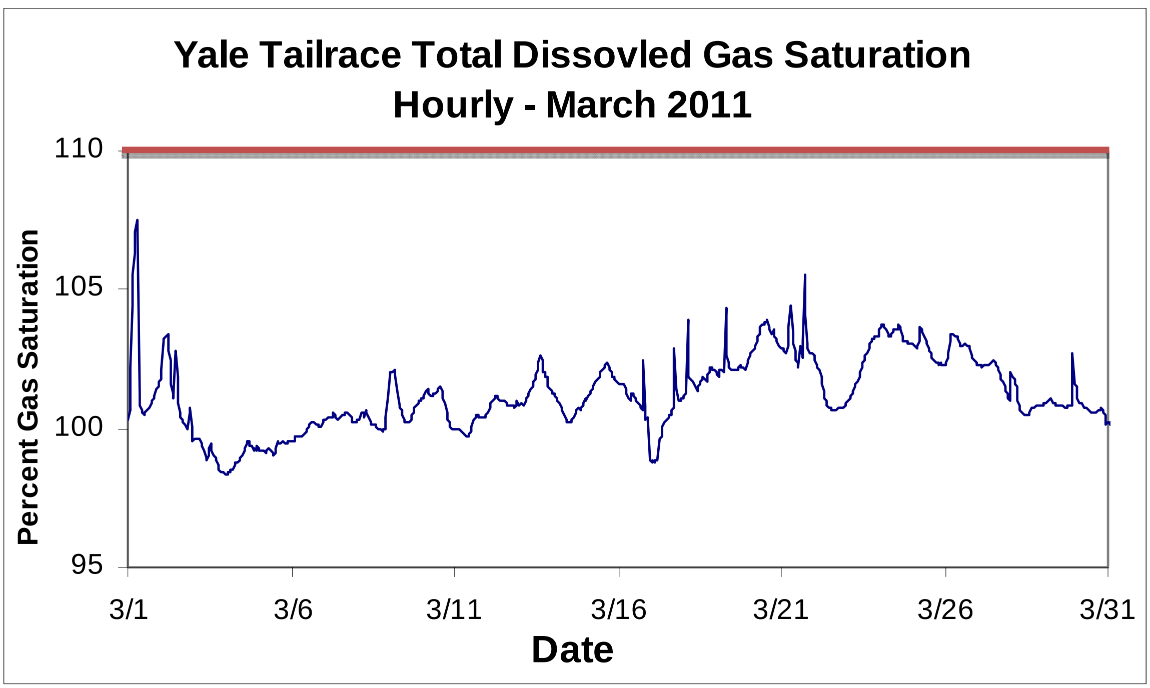
RECOMENDATION	STATUS
Annual Operating Plan for steelhead should be completed by December 31 of each year.	COMPLETE: Final plan was submitted by December 31
Spawning protocols for steelhead will be revisited for out of basin stocks.	COMPLETE: New protocols were developed as part of the 2010 AOP and have since been incorporated into the 2011 AOP
What is the preferred disposition of steelhead fry that result in genetic assignment to summer or hatchery fish?	COMPLETE: All steelhead fry that assign to hatchery or summer origin after spawning will be placed in Battleground Lake. Preference is to avoid this scenario.
Reduce the amount of time genetic assignment analysis takes and when results are provided. That is, results were not known prior to in-river collection at times, which caused the unnecessary removal of steelhead from their spawning locations.	COMPLETE: Set scheduling with the NMFS genetic lab has reduced holding time at Merwin hatchery and the NMFS genetics lab has made positive changes to enhance the turnaround time.
There is a benefit to having more participation by guides. Especially in our ability to collect females.	COMPLETE: The use of guides or volunteer anglers has been abondoned due to concerns of ESA listed species and handling and hooking mortality. In addition, communication and participation is sporadic
Coordination activities need to have consistent communication among all members, but especially within the in-river collection activities and with hatchery staff. Weekly conference call should be implemented.	COMPLETED: Coordination takes place between the lead cooridinator and interested entities (e.g., WDFW management and hatchery staff).
In-river collection timing will be reduced by two weeks to limit the effect on actively spawning steelhead.	COMPLETE: In river netting will not extend beyond May 15.
Eliminate fecundity sampling on green eggs	COMPLETE:
Eliminate ovarian fluid sampling	UNKNOWN
Evaluate the effect of ozone treated water	Not Evaluated
The effect or occurrence of poor quality milt or eggs	Not Evaluated
The use of circular tanks for holding broodstock and kelts (if implemented)	COMPLETE
Use of MS-222 to reduce handling stress	COMPLETE: Use of EA has been incorporated
Use of rubberized nets to reduce descaling and slime removal	UNKNOWN
Improve the balance or ratio of males and females at the hatchery to ensure that adequate females and males are available to achieve spawning protocols.	IN PROCESS: This is problematic becuase the ability to capture females may be limited by several factors that can not be controlled (e.g. availability of females)

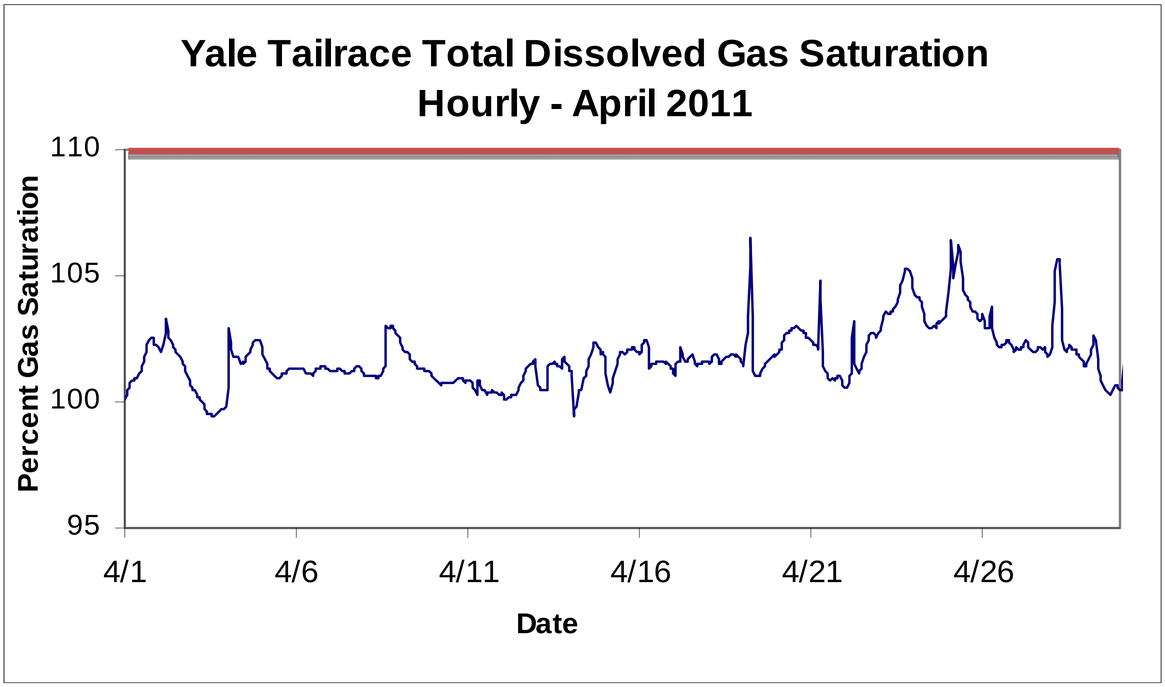
Attachment G
Yale Water Quality Graphs

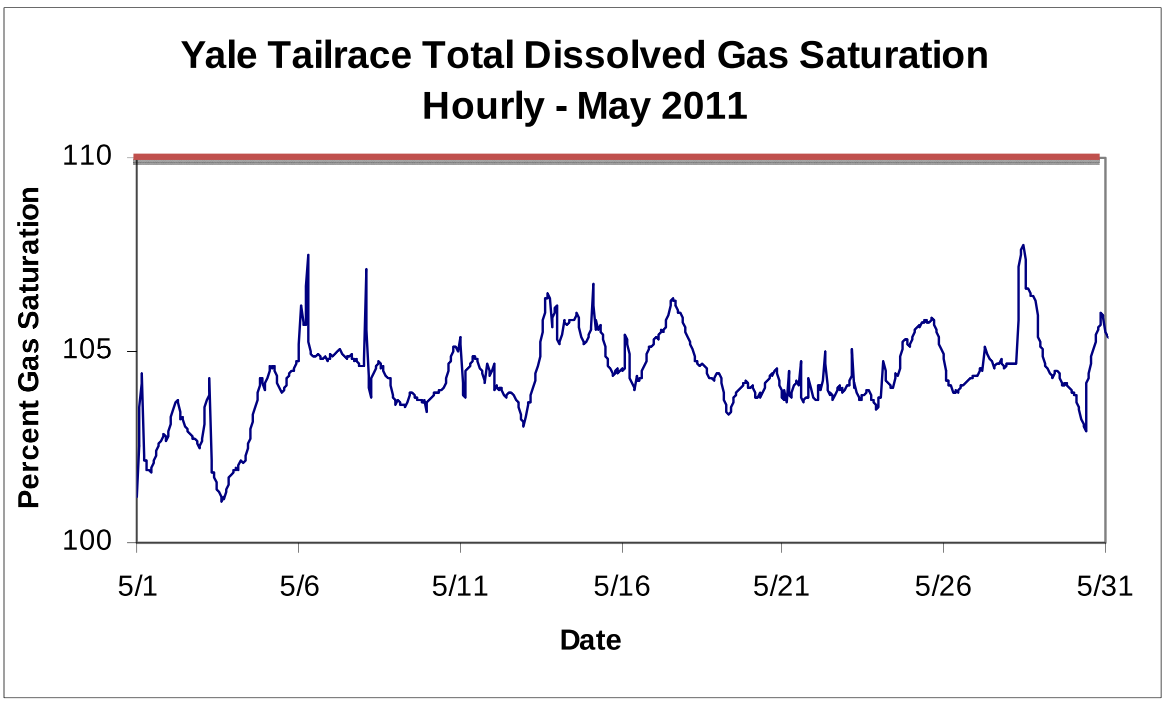

Yale Forebay Depth/Temperature Profiles - 2011
Temperature (C)
4 6 8 10 12 14 16 18 20 22 24
0 10 20 30 40 50 60 70 80 90 100
Forebay Depth (ft)
5/1-5/14
5/15-5/31
6/1-6/14
6/15-6/30
7/1-7/14
7/15-7/31
8/1-8/14
8/15-8/31
9/1-9/14
9/15-9/30
10/1-10/14
10/15-10/31

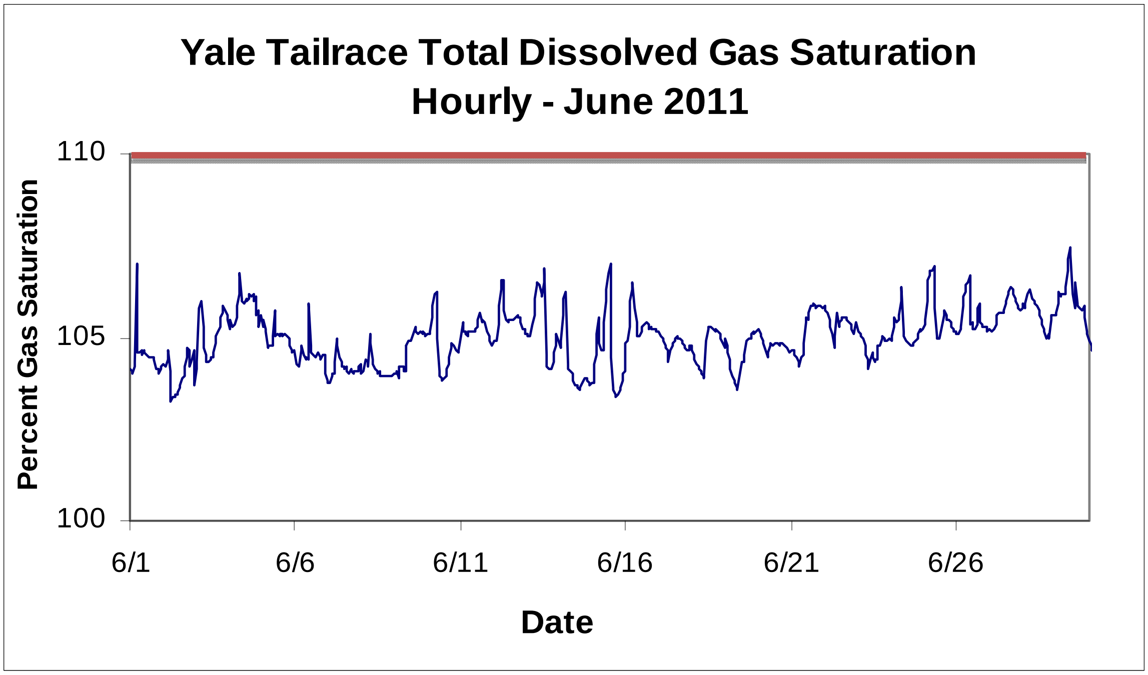

Yale Tailrace Total Dissolved Gas Saturation
Hourly - January 2011
110
105
100
95
Percent Gas Saturation
1/1 1/6 1/11 1/16 1/21 1/26 1/31
Date

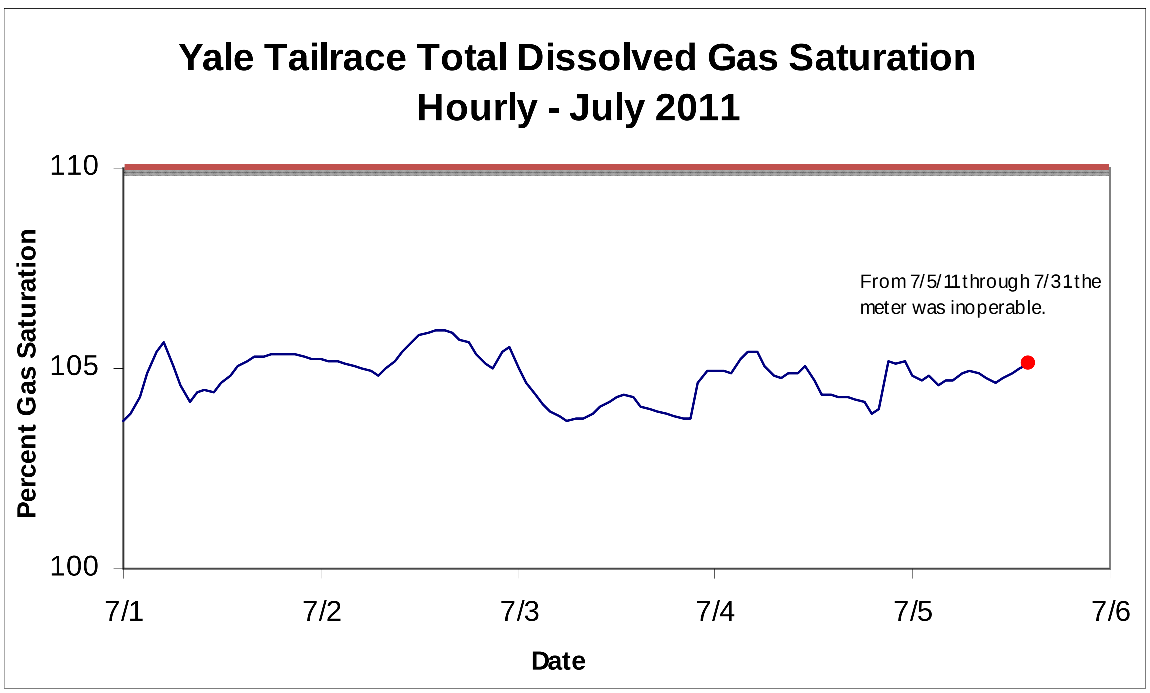

Yale Tailrace Total Dissolved Gas Saturation
Hourly - Feburary 2011
Percent Gas Saturation
110
105
100
95
2/1
2/6
2/11
2/16
2/21
2/26
Date

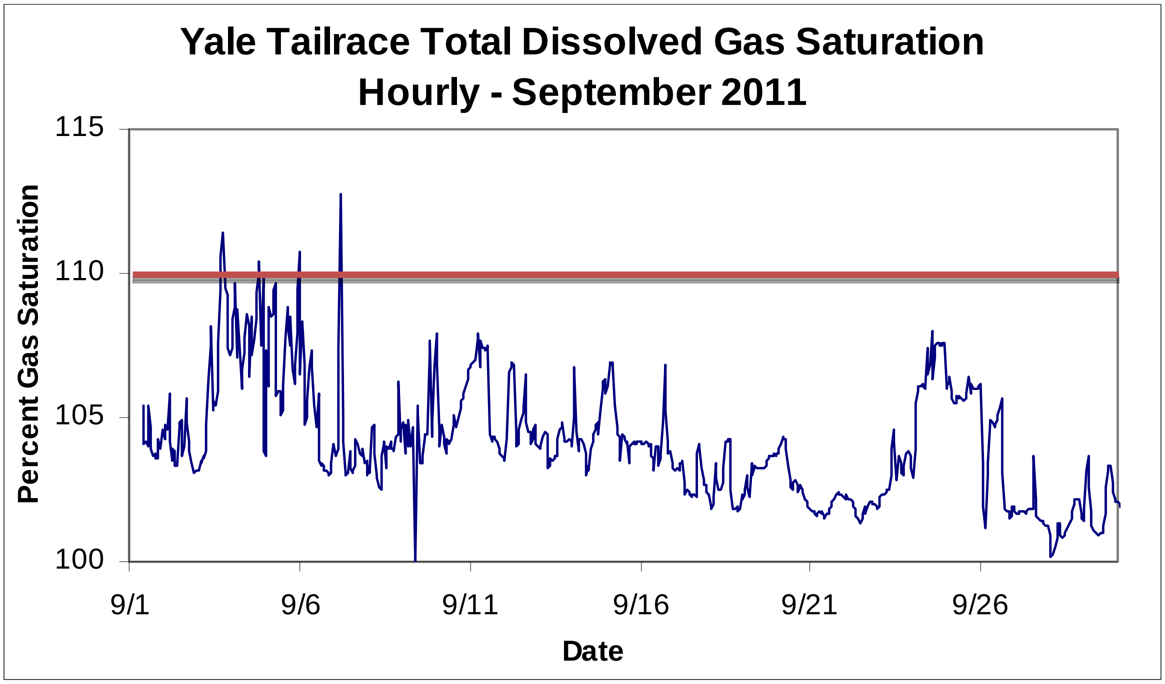

Yale Tailrace Total Dissovled Gas Saturation
Hourly - March 2011
Percent Gas Saturation
110
105
100
95
3/1
3/6
3/11
3/16
3/21
3/26
3/31
Date

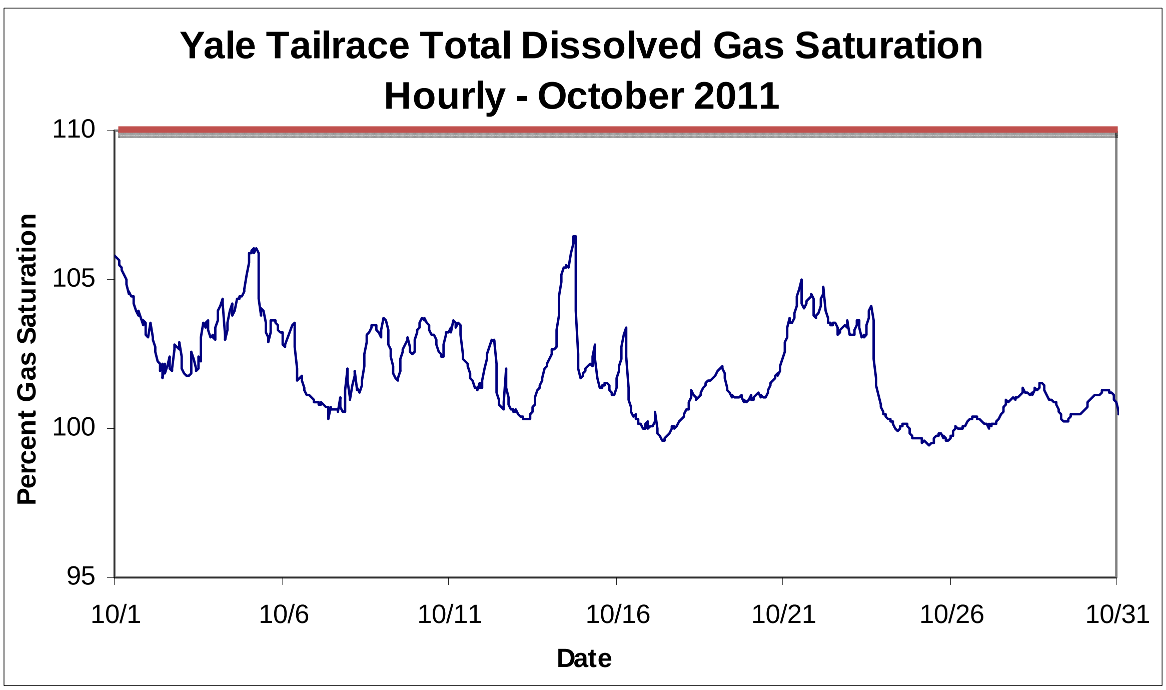

Yale Tailrace Total Dissolved Gas Saturation
Hourly - April 2011
Percent Gas Saturation
110
105
100
95
4/1
4/6
4/11
4/16
4/21
4/26
Date

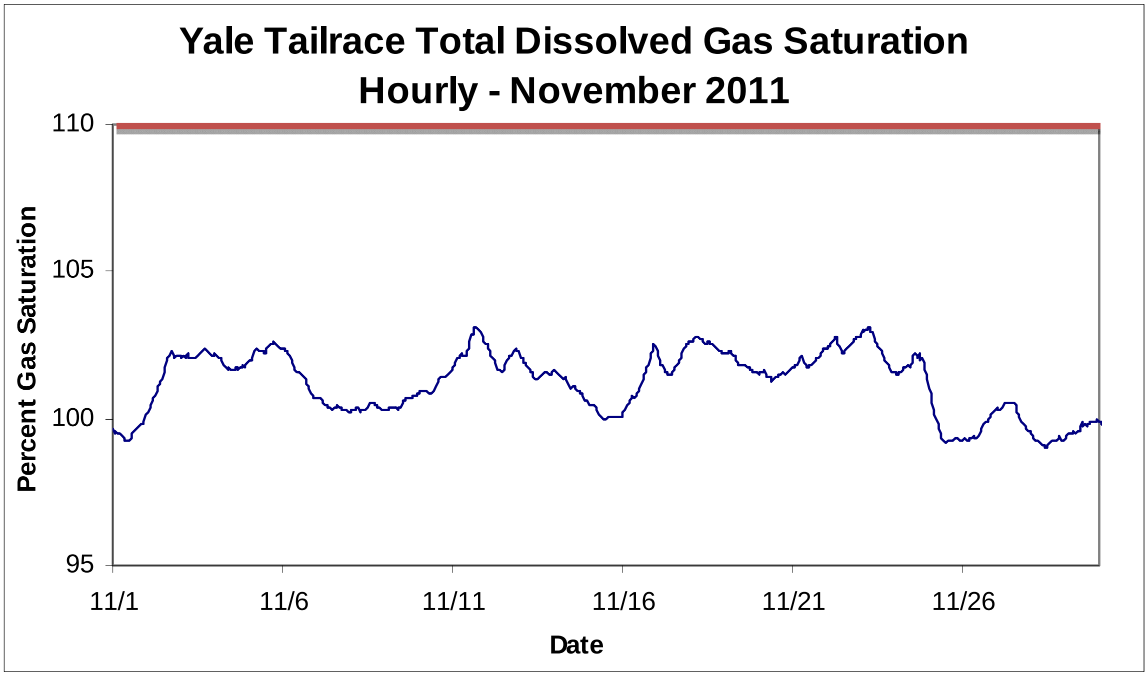

Yale Tailrace Total Dissolved Gas Saturation
Hourly - May 2011
Percent Gas Saturation
110
105
100
5/1
5/6
5/11
5/16
5/21
5/26
5/31
Date

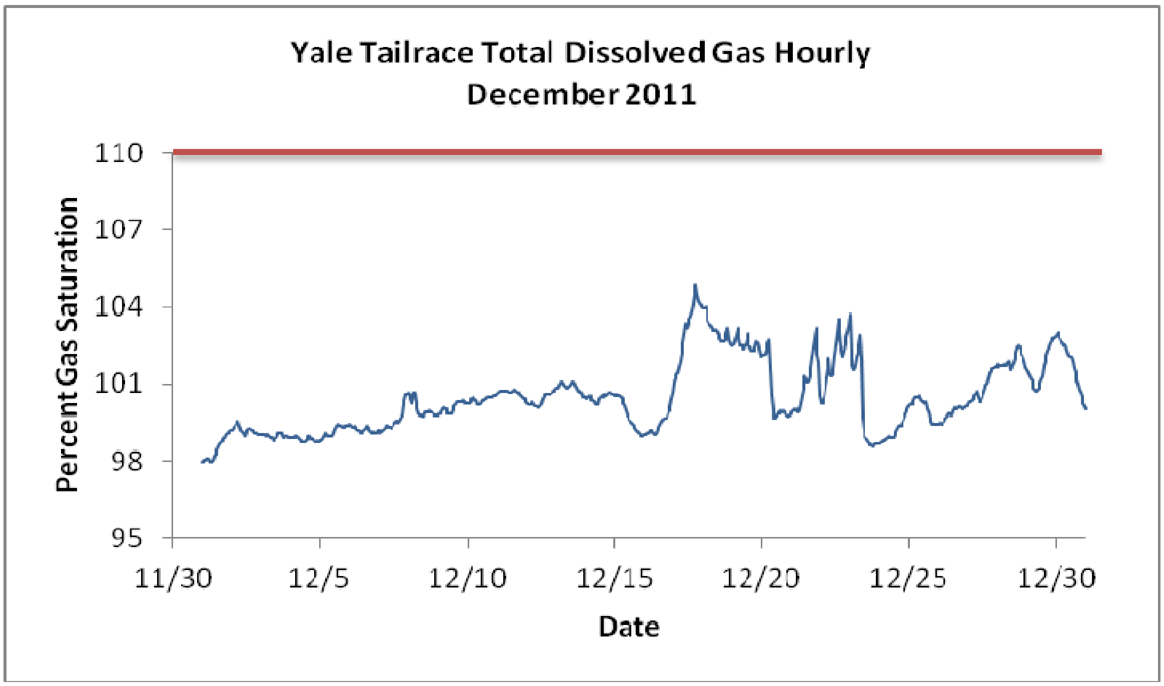

Yale Tailrace Total Dissolved Gas Saturation
Hourly - June 2011
Percent Gas Saturation
110
105
100
6/1
6/6
6/11
6/16
6/21
6/26
Date

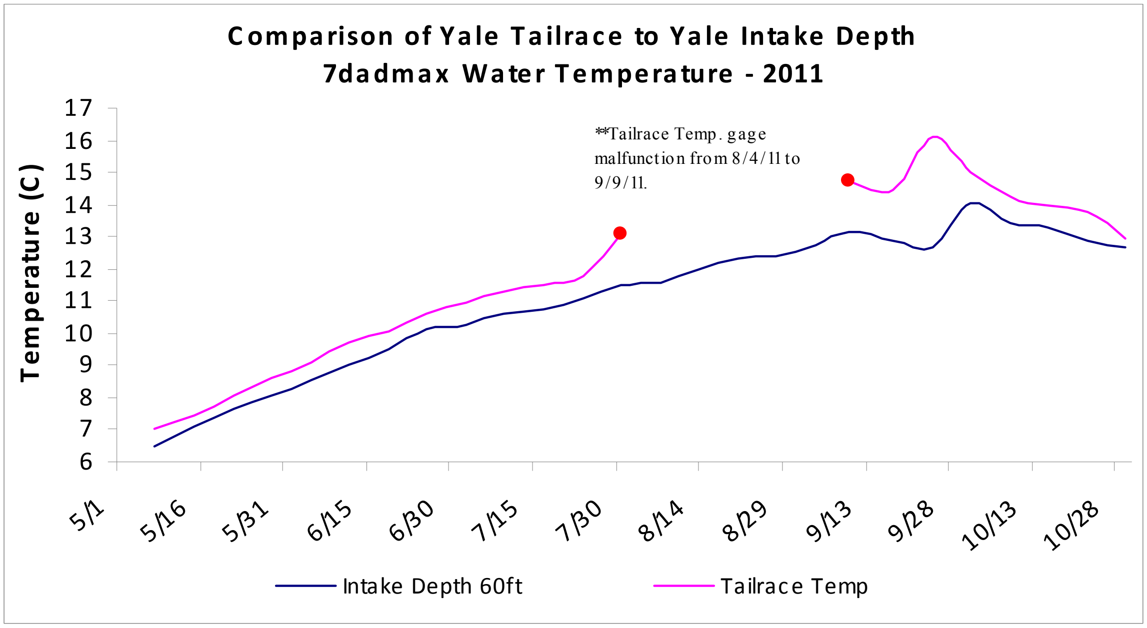

Yale Tailrace Total Dissolved Gas Saturation
Hourly - July 2011
Percent Gas Saturation
110
105
100
From 7/5/11 through 7/31 the meter was inoperable.
7/1
7/2
7/3
7/4
7/5
7/6
Date


Yale Tailrace Total Dissolved Gas Saturation
Hourly - September 2011
Percent Gas Saturation
115
110
105
100
9/1
9/6
9/11
9/16
9/21
9/26
Date

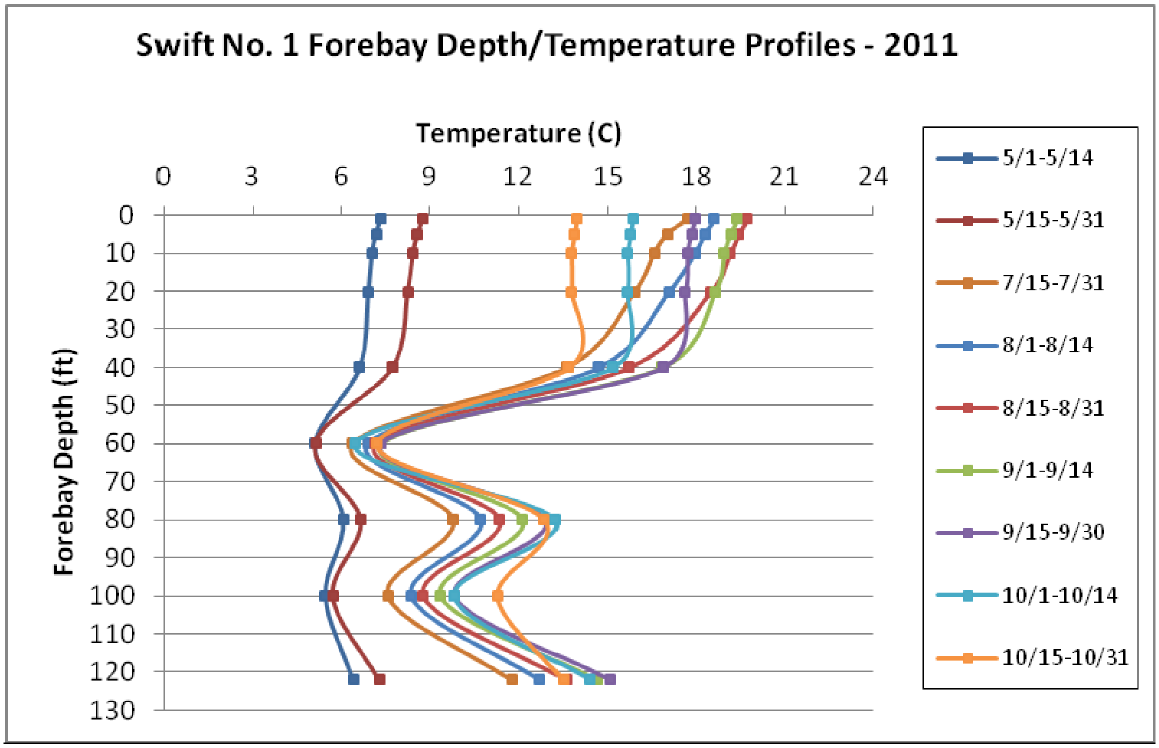

Yale Tailrace Total Dissolved Gas Saturation
Hourly - October 2011
Percent Gas Saturation
110
105
100
95
10/1
10/6
10/11
10/16
10/21
10/26
10/31
Date

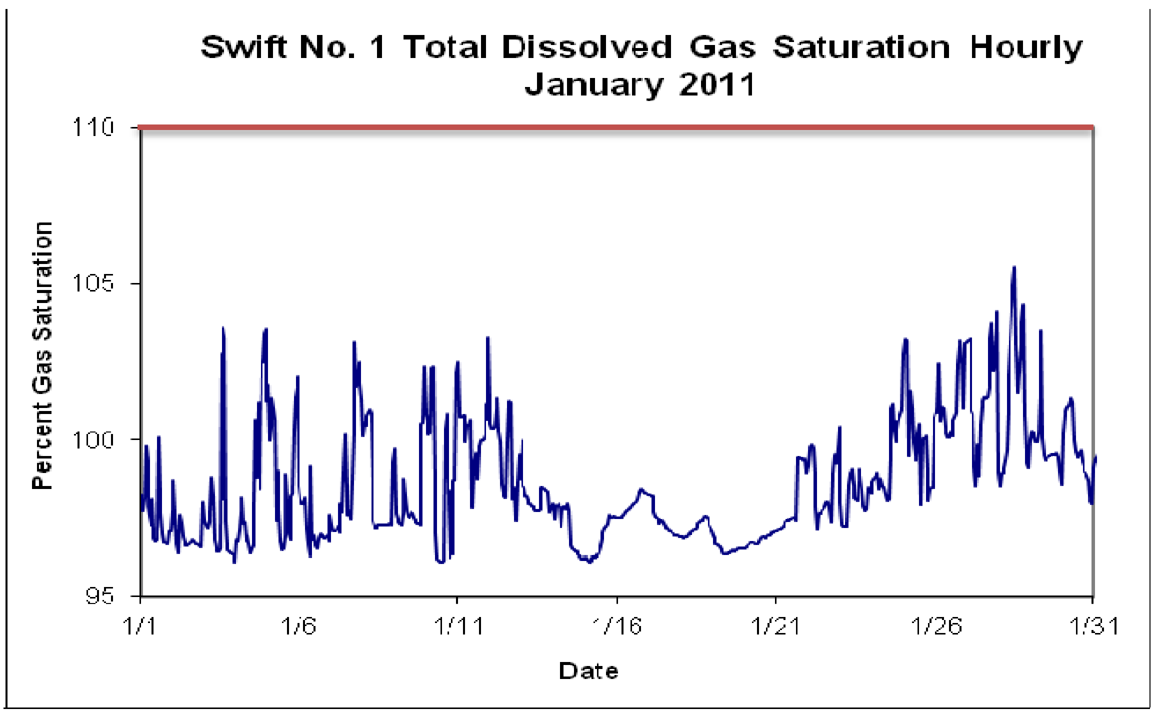

Yale Tailrace Total Dissolved Gas Saturation
Hourly - November 2011
110
105
100
95
Percent Gas Saturation
11/1
11/6
11/11
11/16
11/21
11/26
Date

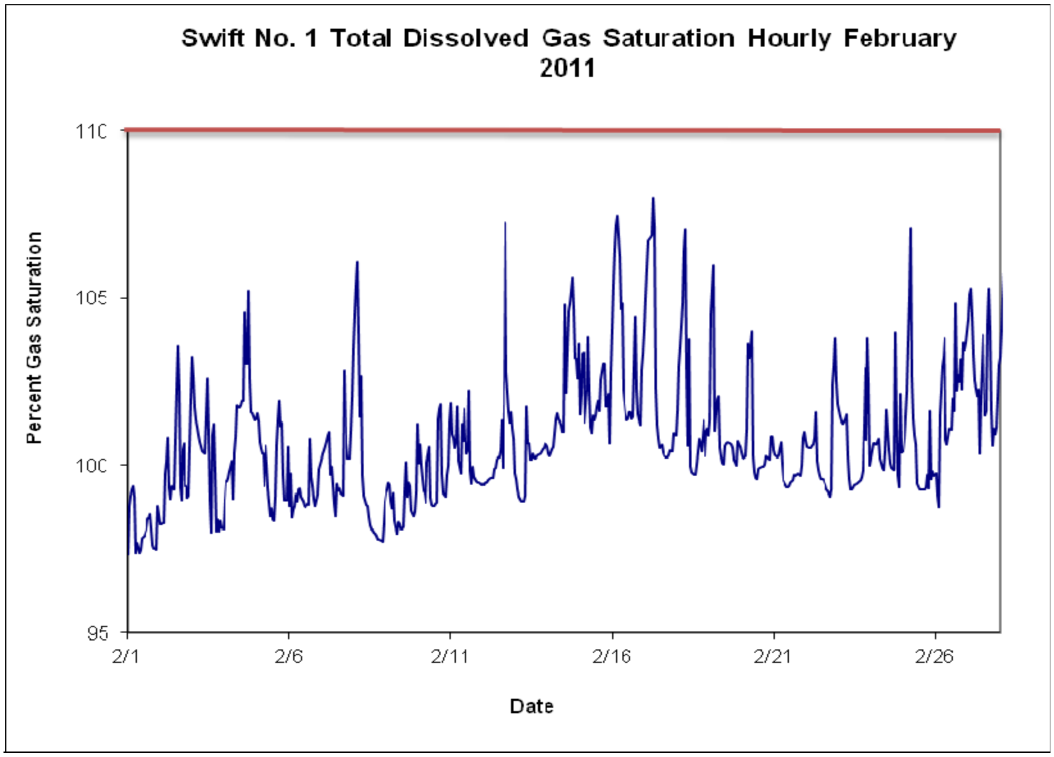

Yale Tailrace Total Dissolved Gas Hourly
December 2011
110
107
104
101
98
95
Percent Gas Saturation
11/30
12/5
12/10
12/15
12/20
12/25
12/30
Date

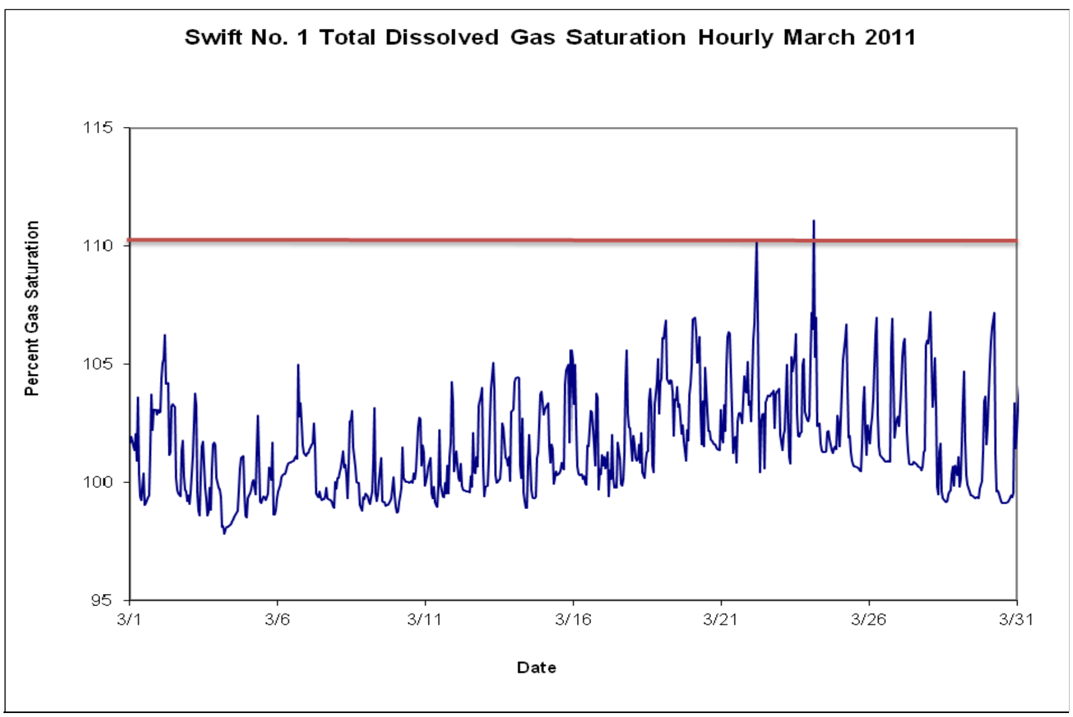

Comparison of Yale Tailrace to Yale Intake Depth
7dadmax Water Temperature - 2011
Temperature (C)
17
16
15
14
13
12
11
10
9
8
7
6
5/1
5/16
5/31
6/15
6/30
7/15
7/30
8/14
8/29
9/13
9/28
10/13
10/28
**Tailrace Temp. gage malfunction from 8/4/11 to 9/9/11.
Intake Depth 60ft
Tailrace Temp

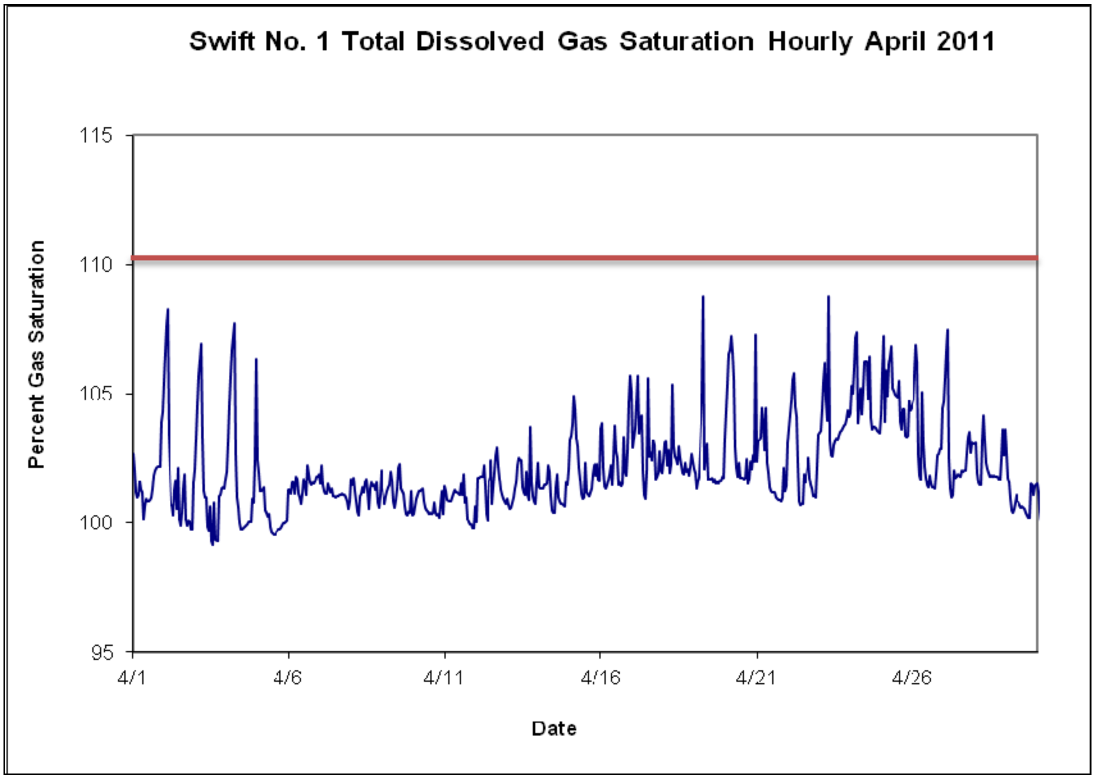
Attachment H
Swift No. 1 Water Quality Graphs

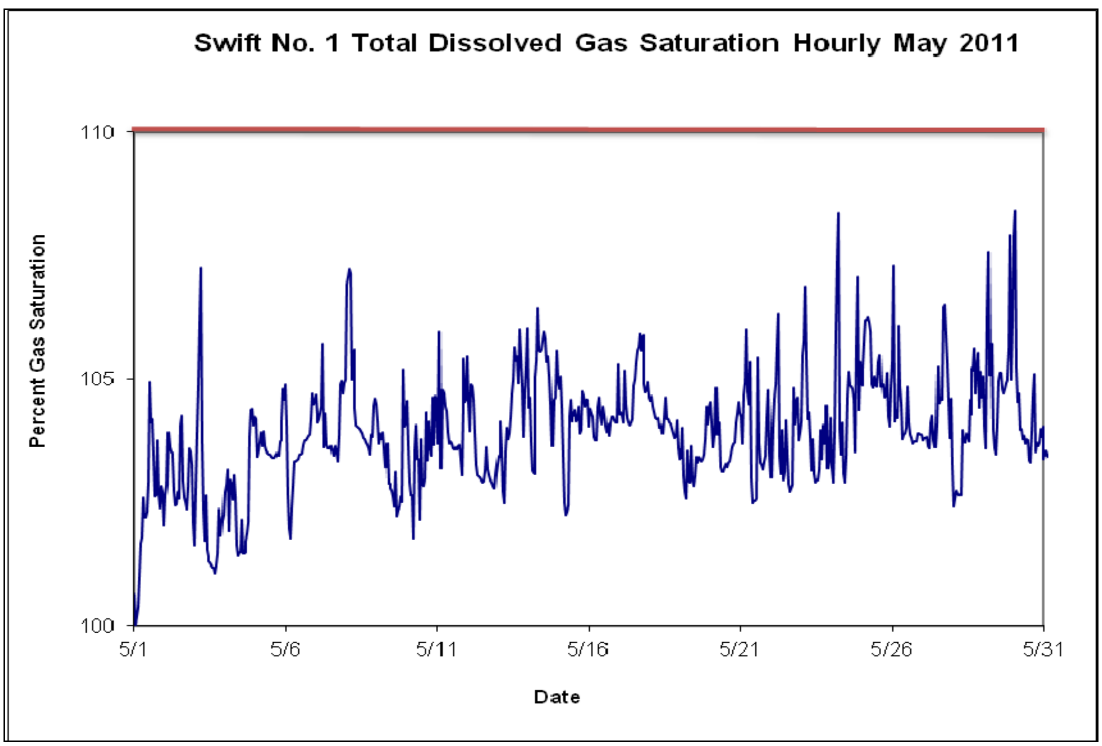

Swift No. 1 Forebay Depth/Temperature Profiles - 2011
Temperature (C)
0
3
6
9
12
15
18
21
24
Forebay Depth (ft)
0
10
20
30
40
50
60
70
80
90
100
110
120
130
5/1-5/14
5/15-5/31
7/15-7/31
8/1-8/14
8/15-8/31
9/1-9/14
9/15-9/30
10/1-10/14
10/15-10/31

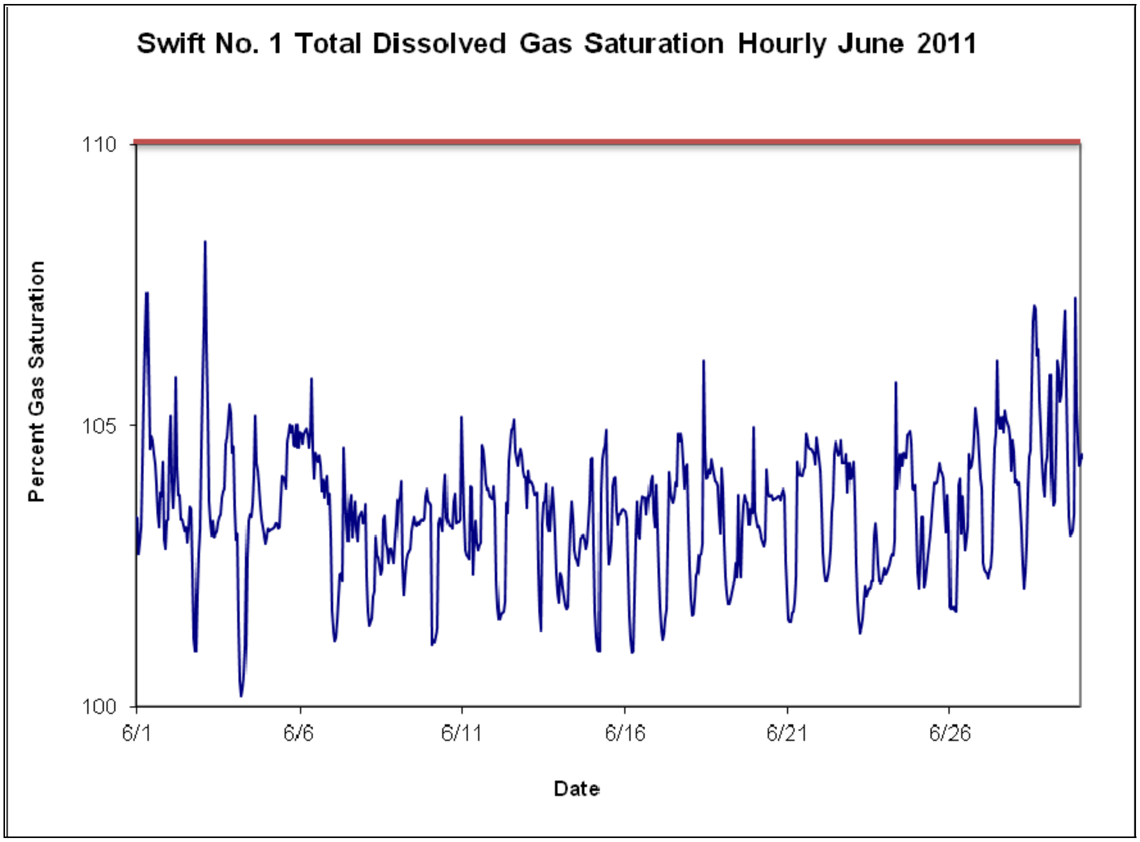

Swift No. 1 Total Dissolved Gas Saturation Hourly
January 2011
Percent Gas Saturation
110
105
100
95
1/1
1/6
1/11
1/16
1/21
1/26
1/31
Date

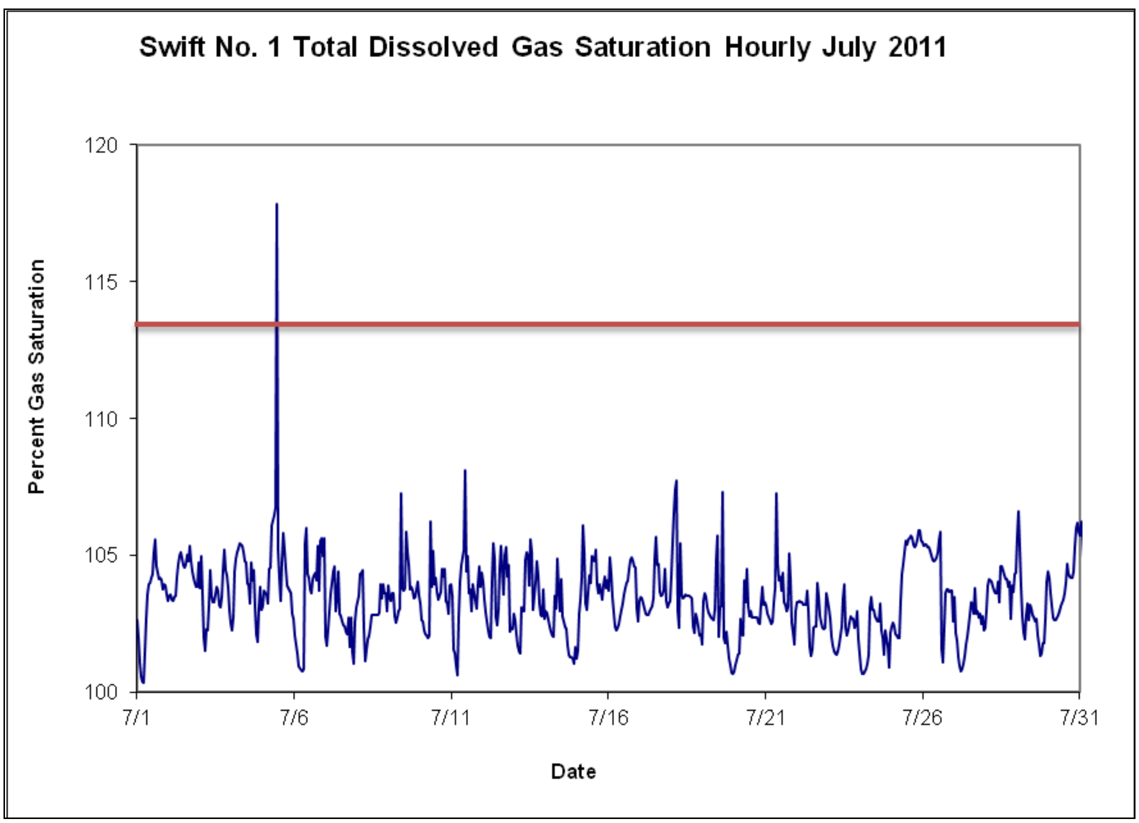

Swift No. 1 Total Dissolved Gas Saturation Hourly February 2011
Percent Gas Saturation
110
105
100
95
2/1
2/6
2/11
2/16
2/21
2/26
Date

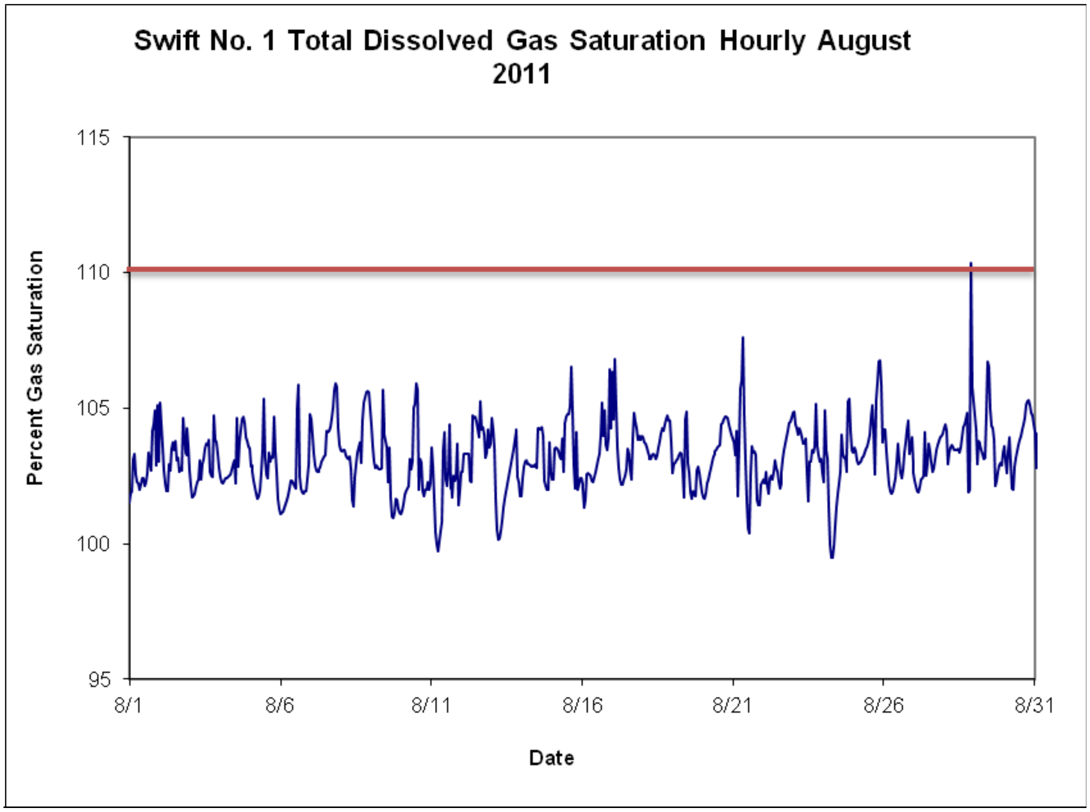

Swift No. 1 Total Dissolved Gas Saturation Hourly March 2011
Percent Gas Saturation
115
110
105
100
95
3/1
3/6
3/11
3/16
3/21
3/26
3/31
Date

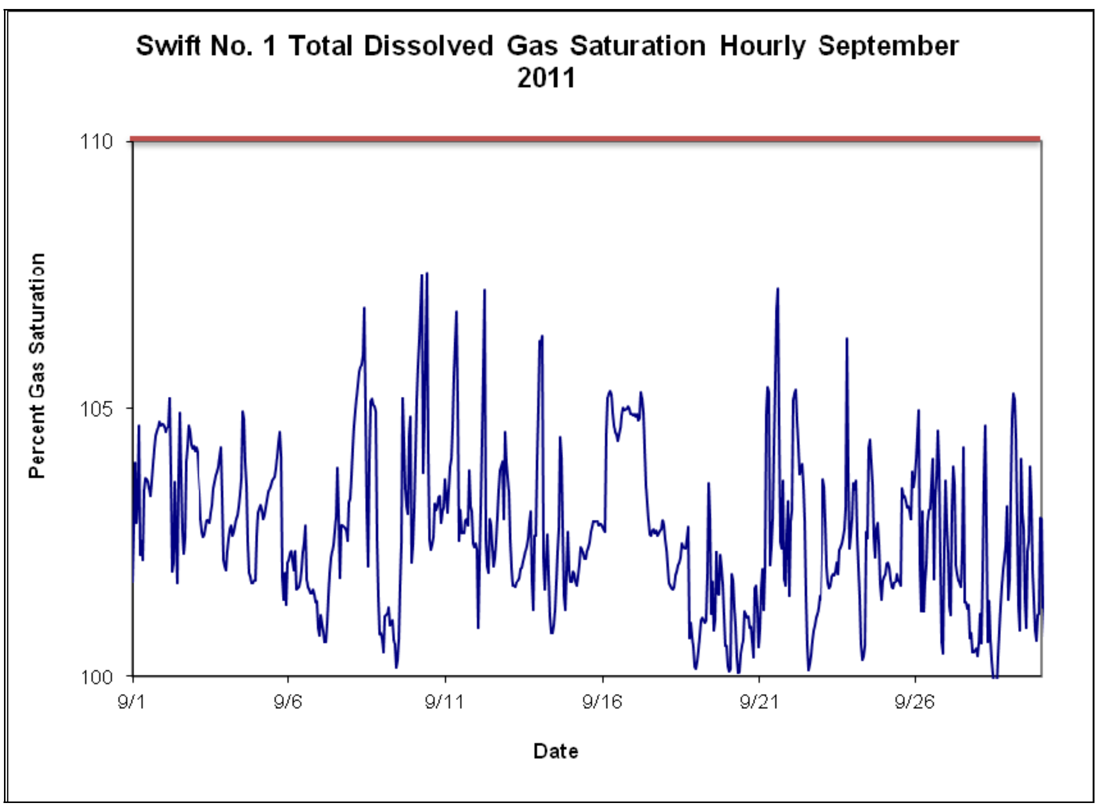

Swift No. 1 Total Dissolved Gas Saturation Hourly April 2011
Percent Gas Saturation
115
110
105
100
95
4/1
4/6
4/11
4/16
4/21
4/26
Date

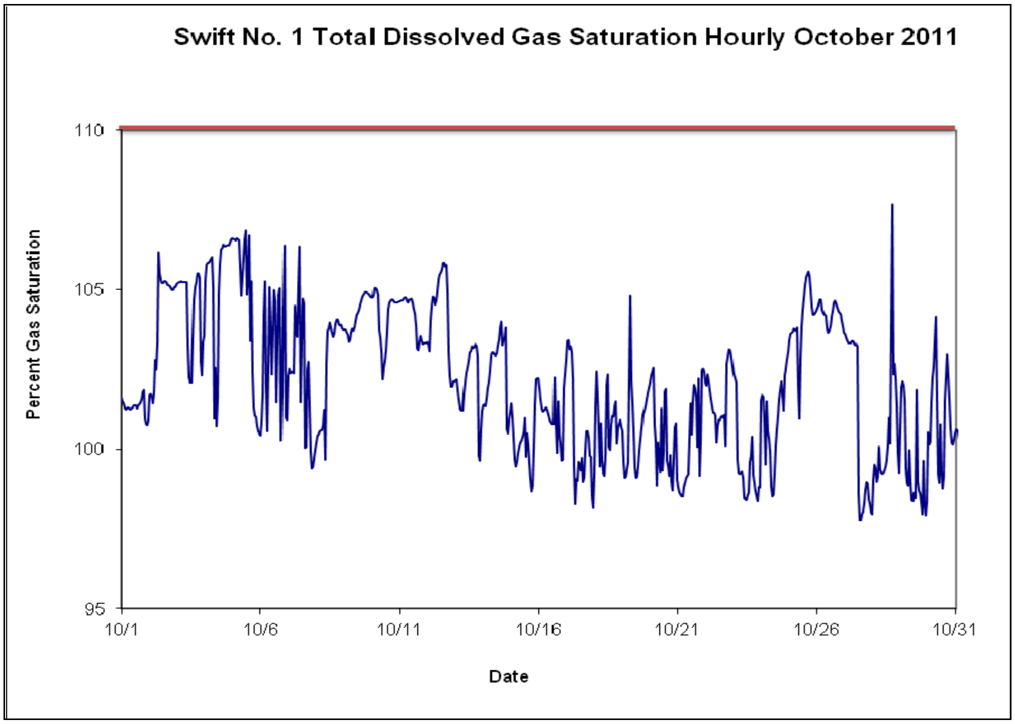

Swift No. 1 Total Dissolved Gas Saturation Hourly May 2011
Percent Gas Saturation
110
105
100
5/1
5/6
5/11
5/16
5/21
5/26
5/31
Date

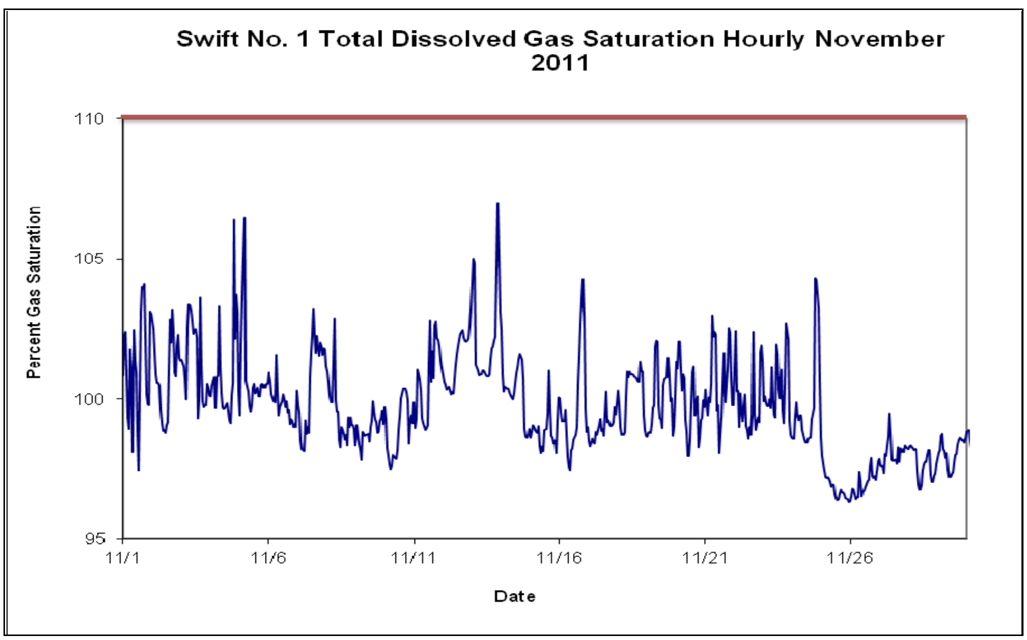

Swift No. 1 Total Dissolved Gas Saturation Hourly June 2011
Percent Gas Saturation
110
105
100
6/1
6/6
6/11
6/16
6/21
6/26
Date

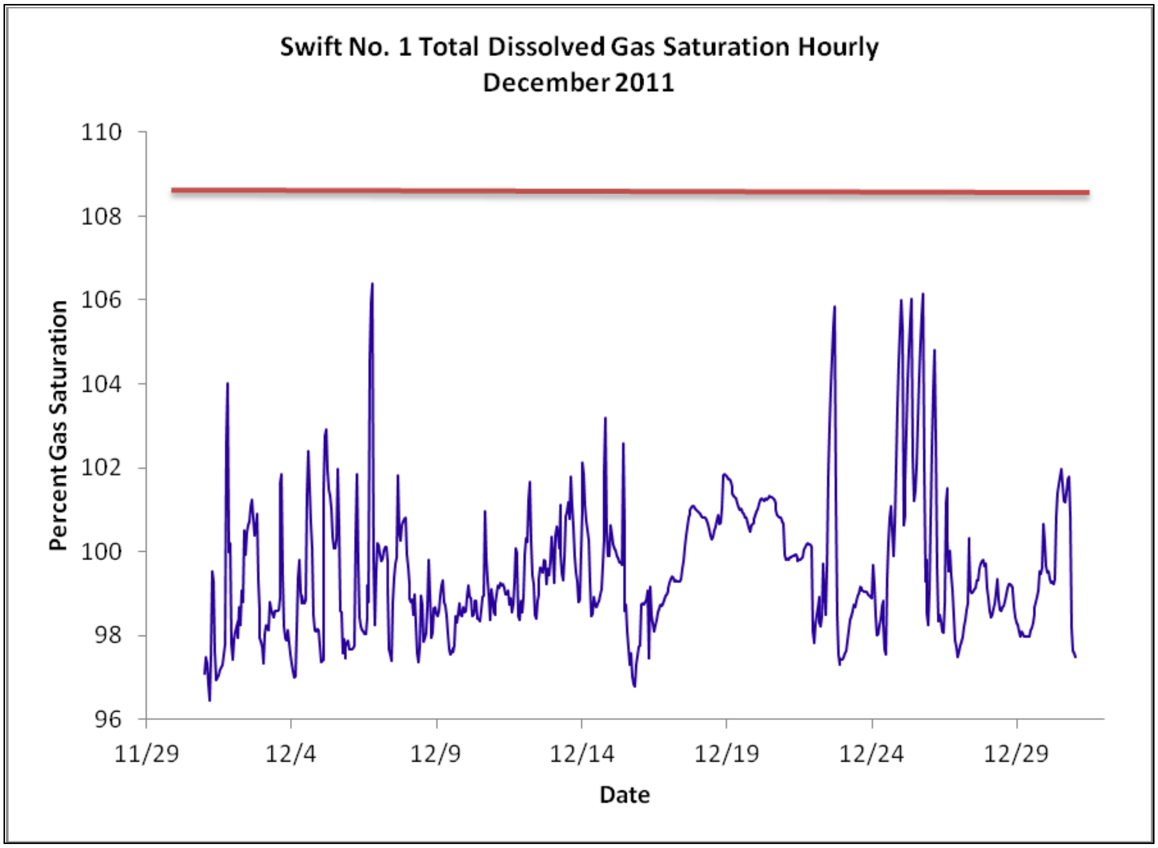

Swift No. 1 Total Dissolved Gas Saturation Hourly July 2011
Percent Gas Saturation
120
115
110
105
100
7/1
7/6
7/11
7/16
7/21
7/26
7/31
Date

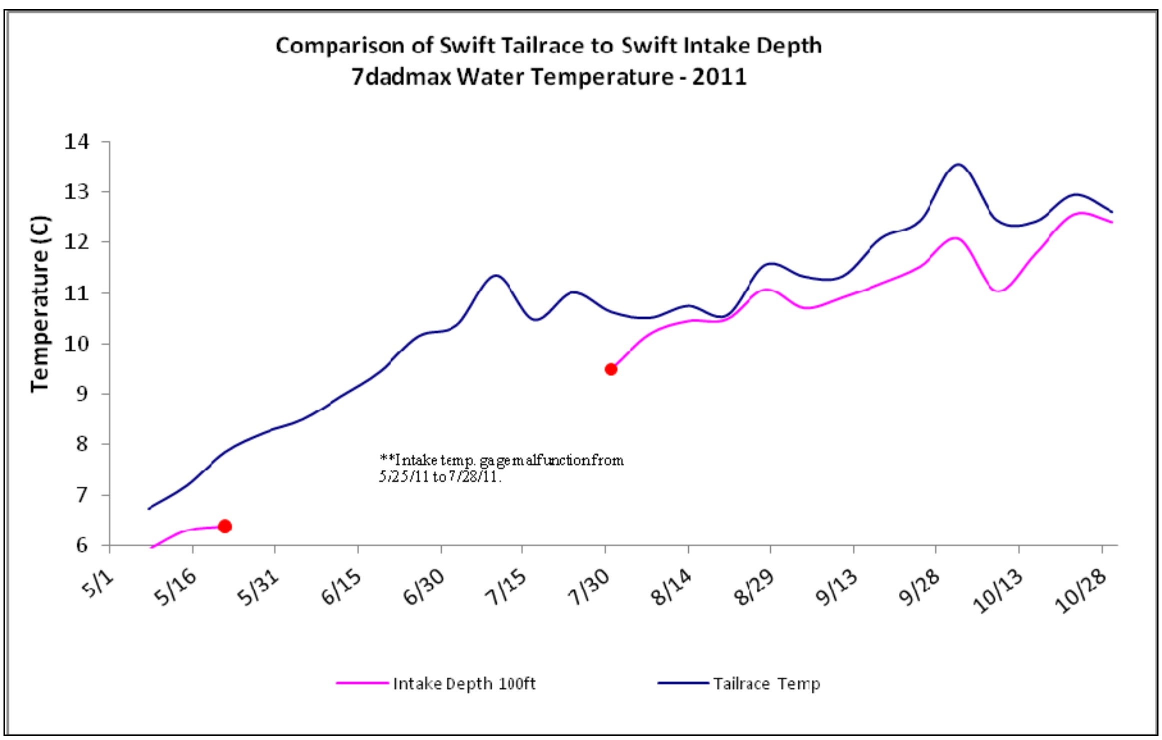

Swift No. 1 Total Dissolved Gas Saturation Hourly August 2011
Percent Gas Saturation
115
110
105
100
95
8/1
8/6
8/11
8/16
8/21
8/26
8/31
Date

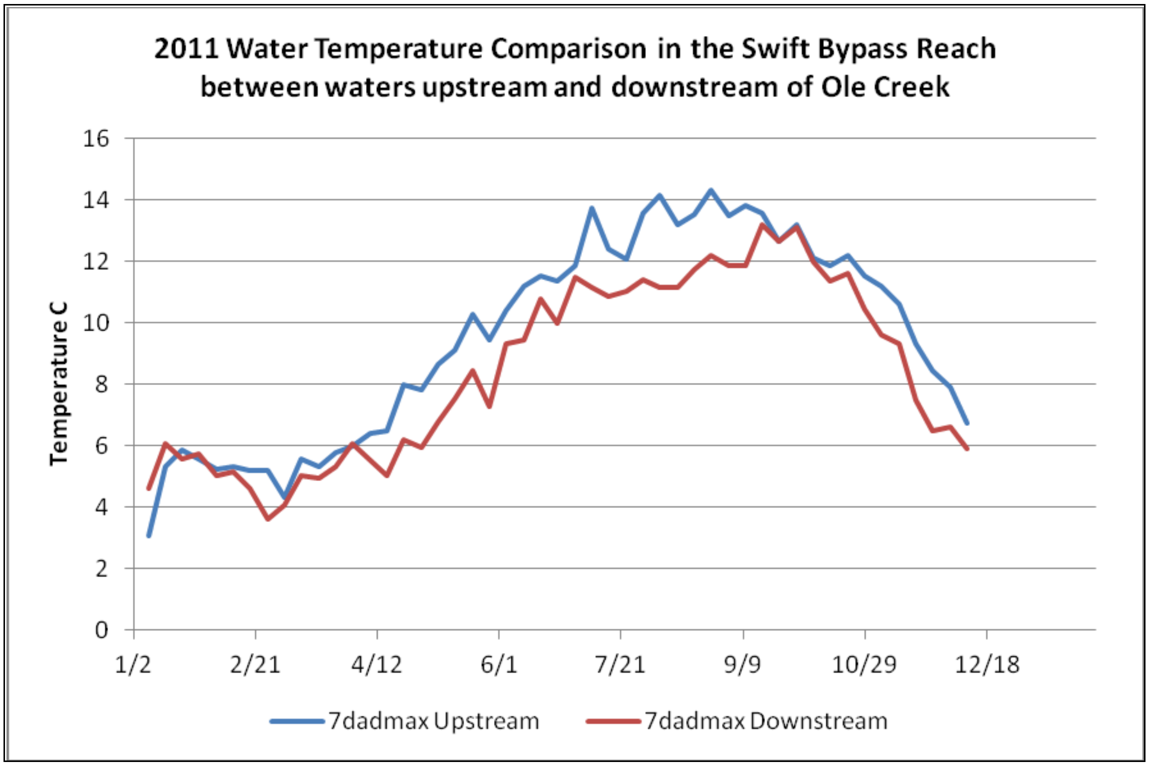

Swift No. 1 Total Dissolved Gas Saturation Hourly September 2011
Percent Gas Saturation
110
105
100
9/1
9/6
9/11
9/16
9/21
9/26
Date


Swift No. 1 Total Dissolved Gas Saturation Hourly October 2011
Percent Gas Saturation
110
105
100
95
10/1
10/6
10/11
10/16
10/21
10/26
10/31
Date

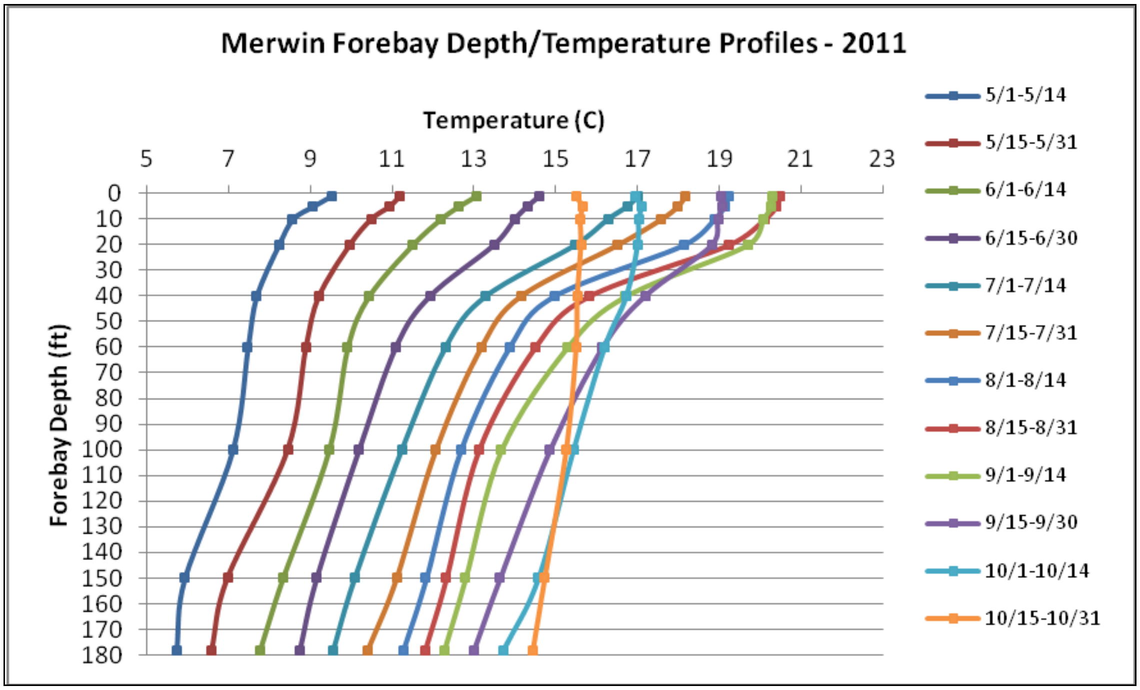

Swift No. 1 Total Dissolved Gas Saturation Hourly November 2011
Percent Gas Saturation
110
105
100
95
11/1
11/6
11/11
11/16
11/21
11/26
Date

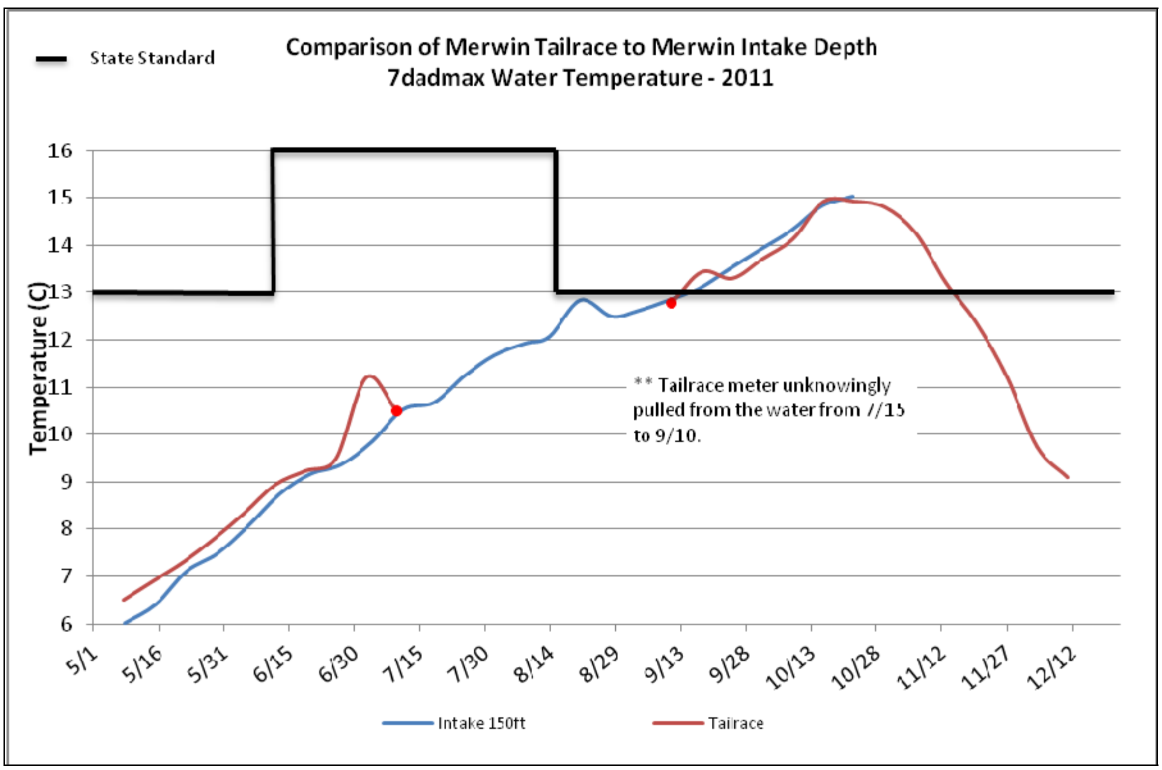

Swift No. 1 Total Dissolved Gas Saturation Hourly
December 2011
Percent Gas Saturation
110
108
106
104
102
100
98
96
11/29
12/4
12/9
12/14
12/19
12/24
12/29
Date

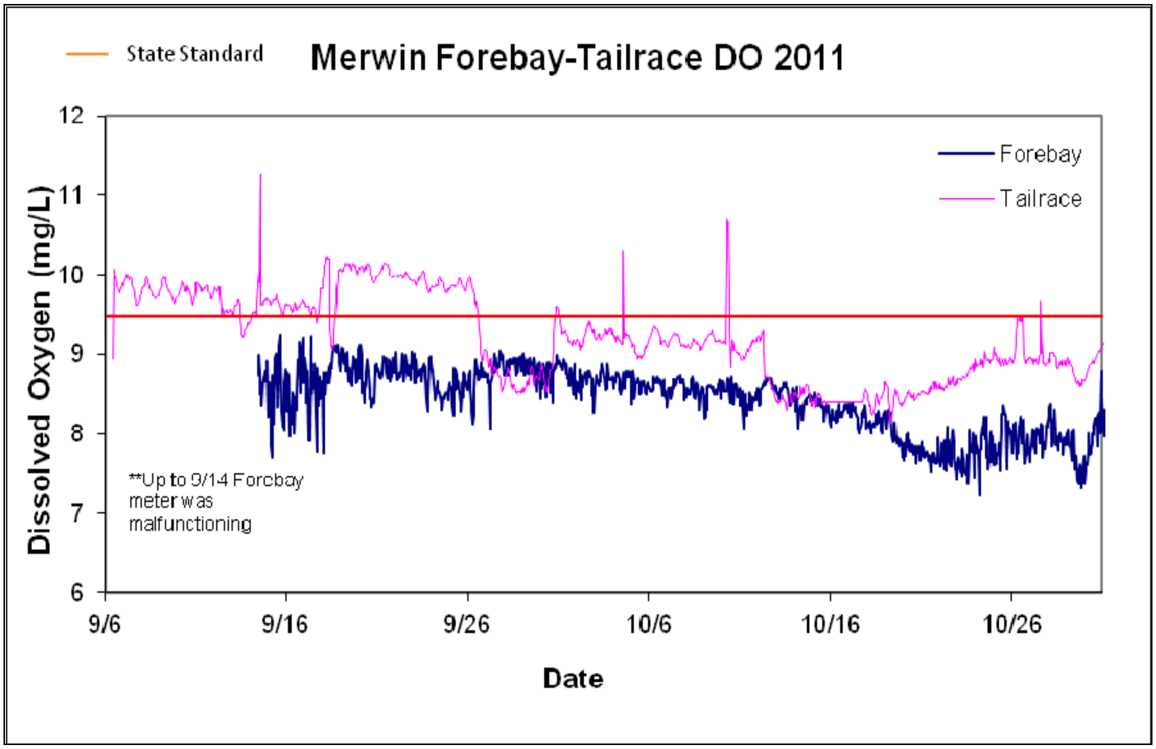

Comparison of Swift Tailrace to Swift Intake Depth
7dadmax Water Temperature - 2011
Temperature (C)
14
13
12
11
10
9
8
7
6
5/1
5/16
5/31
6/15
6/30
7/15
7/30
8/14
8/29
9/13
9/28
10/13
10/28
**Intake temp. gage malfunction from
5/25/11 to 7/28/11.
Intake Depth 100ft
Tailrace Temp


2011 Water Temperature Comparison in the Swift Bypass Reach
between waters upstream and downstream of Ole Creek
Temperature C
16
14
12
10
8
6
4
2
0
1/2
2/21
4/12
6/1
7/21
9/9
10/29
12/18
7dadmax Upstream
7dadmax Downstream

Attachment I
Merwin Water Quality Graphs


Merwin Forebay Depth/Temperature Profiles - 2011
Temperature (C)
5 7 9 11 13 15 17 19 21 23
Forebay Depth (ft)
0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150 160 170 180
5/1-5/14
5/15-5/31
6/1-6/14
6/15-6/30
7/1-7/14
7/15-7/31
8/1-8/14
8/15-8/31
9/1-9/14
9/15-9/30
10/1-10/14
10/15-10/31


State Standard
Comparison of Merwin Tailrace to Merwin Intake Depth
7dadmax Water Temperature - 2011
Temperature (C)
16 15 14 13 12 11 10 9 8 7 6
** Tailrace meter unknowingly pulled from the water from 7/15 to 9/10.
5/1 5/16 5/31 6/15 6/30 7/15 7/30 8/14 8/29 9/13 9/28 10/13 10/28 11/12 11/27 12/12
Intake 150ft
Tailrace


State Standard
Merwin Forebay-Tailrace DO 2011
Forebay
Tailrace
Dissolved Oxygen (mg/L)
12
11
10
9
8
7
6
**Up to 9/14 Forebay meter was malfunctioning
9/6
9/16
9/26
10/6
10/16
10/26
Date

Attachment J

Cougar Creek Kokanee 2011 Escapement Report

Lewis River Hydroelectric Project

Yale, FERC Project No. 2071

Cougar Creek Kokanee
(Oncorhynchus nerka)
2011 Escapement Report

Yale Hydroelectric Proejct

PACIFICORP ENERGY
A DIVISION OF PACIFICORP

January 2011

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2.0 METHODS 4

2.1 DISTRIBUTION AND TIMING 4
2.2 ESCAPEMENT 4
2.3 LENGTH DISTRIBUTION 6

3.0 SWIFT BYPASS REACH 8

4.0 CONCLUSION 9

1.0 INTRODUCTION

Per Article 402(b) of the Yale and Swift Federal Energy Regulatory Commission (FERC) operating licenses and Article 402(c) of the Merwin FERC operating license, this report presents results of kokanee spawner surveys conducted on Cougar Creek and areas within the Swift Bypass Reach in 2011.

2.0 METHODS

As in previous years, Cougar Creek was surveyed on foot by two surveyors. Kokanee were counted from the stream mouth upstream to its origin, a distance of approximately 2,100 meters. The peak kokanee escapement estimate increased in 2011 from 2010 (18,492) to 45,103. This is the highest estimate since 2003 and is well above the latest ten-year average of 35,047. The population still continues to remain below the running average of approximately 65,000 kokanee (1978-2011).

For survey purposes, the accessible anadromous fish habitat in Cougar Creek was broken into five survey reaches. There are a series of three major log jams in Reach 2 and 3 of Cougar Creek. In 2011, the upper extent of kokanee spawning occurred throughout Reach 3.

Cougar Creek was surveyed for kokanee five times in 2011 (Table 1). Survey conditions were exceptional with mild weather and good water clarity throughout the survey period. Stream flows during the entire survey period (September-October) were stable.

2.1 Distribution and Timing

The peak kokanee count was recorded on October 11th (Table 1). The peak timing of kokanee abundance in 2011 is comparable to historical peaks on record (Table 2). Most kokanee were observed in Reach 2, which is also consistent with prior years. This largest concentration of kokanee occurs just downstream of the first log jam in Reach 2.

Table 1. Distribution and peak counts of kokanee in Cougar Creek in 2011
* Estimate uses a 2.3 multiplier (Graves unpublished data, 1982)

Reach	Kokanee Escapement				
	19-Sep	26-Sep	3-Oct	11-Oct	17-Oct
Reach 1	0	1,330	3,500	4,280	3,010
Reach 2	0	2,470	5,340	7,380	5,510
Reach 3	3	0	3,550	7,950	6,800
Reach 4	0	0	0	0	0
Reach 5	0	0	0	0	0
Spawning Estimate*	8	8,120	28,497	45,103	35,236

2.2 Escapement

The kokanee spawning escapement in 2011 is estimated at 45,103 (Figure 1). This marks a 144% increase from the peak observed in 2010 (18,492), while still remaining below the annual historical running average of 64,449. This year's estimate is greater than the ten-year average of 35,047.

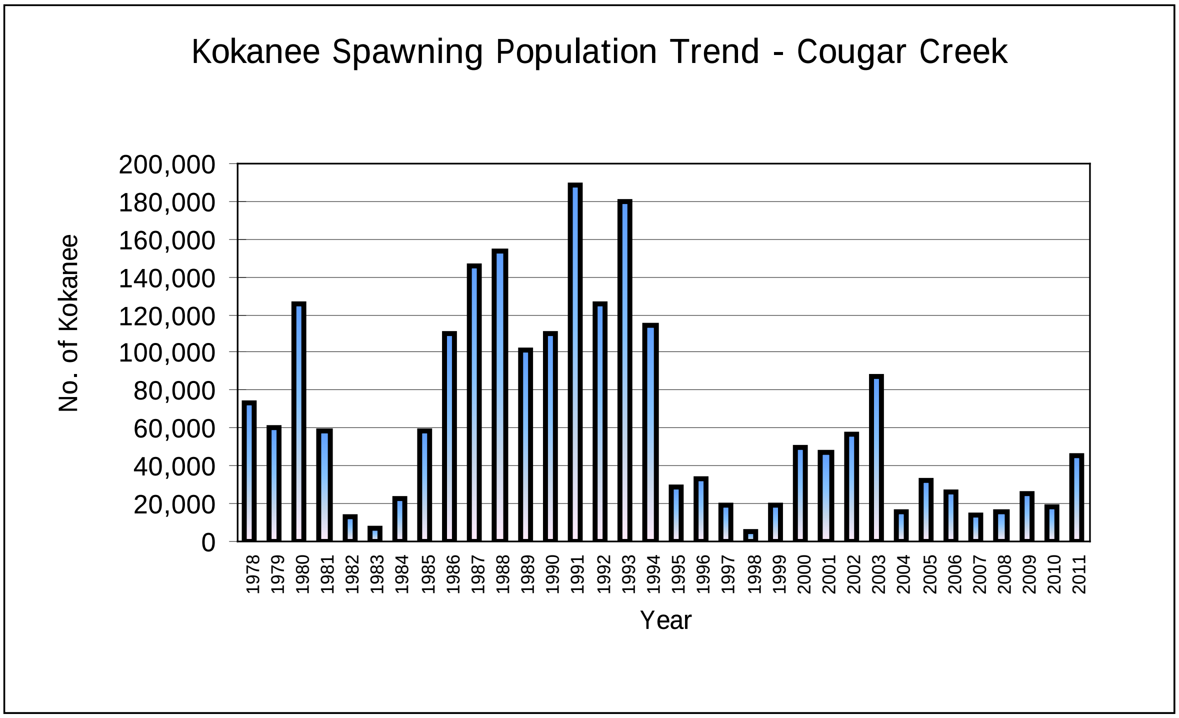


Figure 1. Kokanee spawning estimates for Cougar Creek, 1978-2011

2.3 Length Distribution

Lengths were measured from 30 male and 30 female kokanee (Figure 2). The average lengths of male and female kokanee this year were 263.5 and 254.9 mm, respectively.

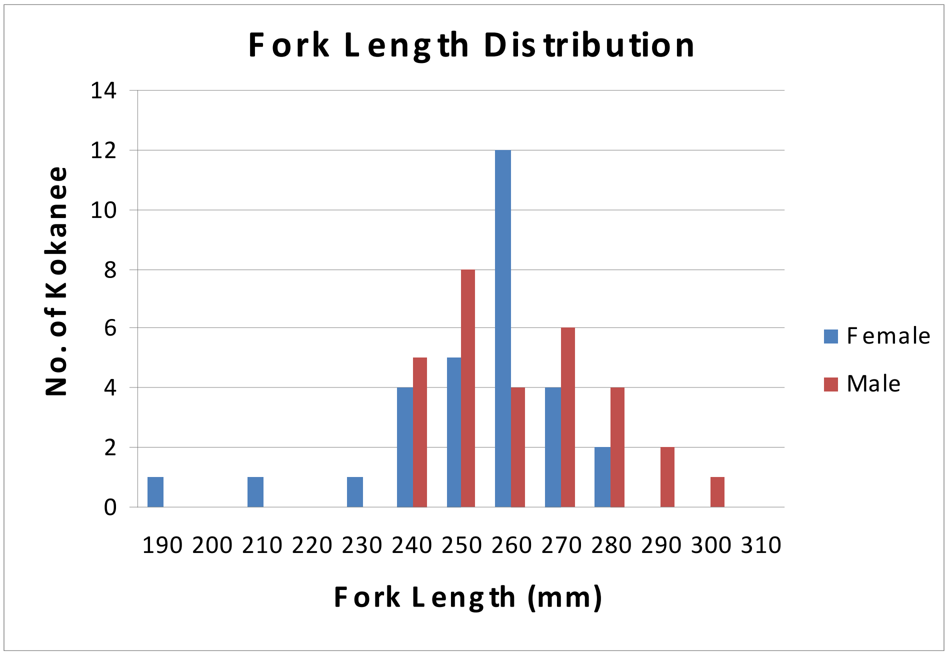


Figure 2. Length frequency histogram of male (n=30) and female (n=30) kokanee lengths (FL) sampled in Cougar Creek, Washington – 2011

The average length of this year's female kokanee (254.9 mm) is less than the average female length observed in 2010 (303 mm). The largest sampled female length (280 mm) was less than the average of 2010 (303 mm). The average female fork length in 2011 is well below the average length over the period of record (291 mm), dating back to 1978. With the regression line established in figure 3, the average fork length size for females in 2011 is over-estimated by the equation by 17.5%. The fitted line suggests the females average length should be 299.6 mm while the observed average was 254.9 mm. This size at spawning estimate indicates that during the time spent maturing in Yale reservoir for this age-class of fish, the reservoir production in terms of food availability and fish growth may have been less than ideal. When kokanee are smaller than anticipated (based on size at spawning and spawning escapement) it may be an indication that reservoir productivity was limited at some point during their residency in Yale reservoir.

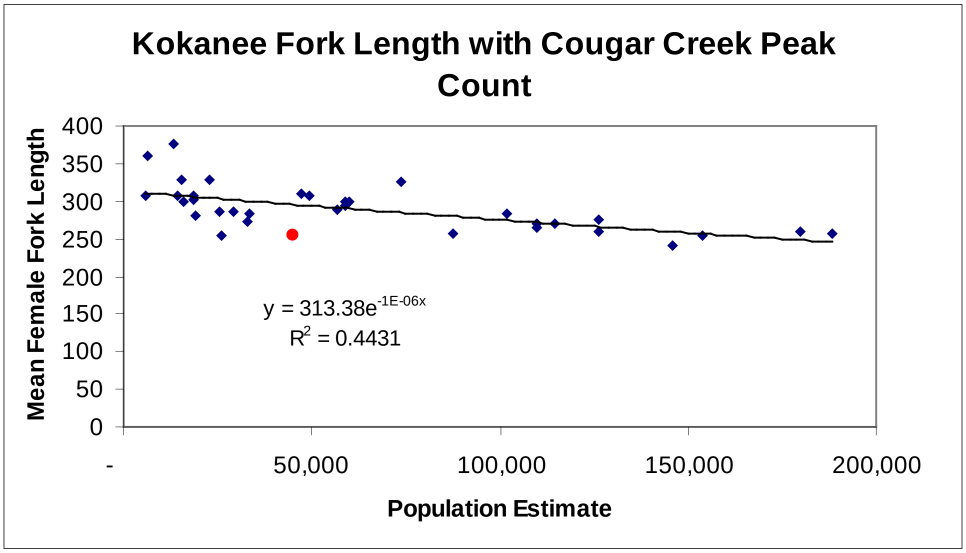


Figure 3. Relationship between mean kokanee fork length (female) and spawning escapement in Cougar Creek (1978-2009). Red dot represents 2011, blue dots are prior years on record.

3.0 SWIFT BYPASS REACH

With the completion of habitat improvement projects at the upper end of the Swift Bypass Reach (the Constructed Channel and Upper Release Point) and the re-establishment of a higher inflow coming in from the Upper Release Point near the Swift 1 powerhouse in early 2010, it is anticipated that kokanee use of the Swift Bypass Reach will increase over time.

To document kokanee spawning use as well as evaluate the Swift Bypass Reach's contribution to the Yale reservoir kokanee spawning escapement, one-time spawning surveys similar to those used for Cougar Creek, were performed in key spawning tributaries to the bypass reach at the same time as the Cougar Creek peak spawn time-frame (Table 2). Each survey extended to the tributaries anadromous fish barrier.

Table 2. Distribution and peak counts of kokanee in areas of the Swift Bypass Reach in 2011

Reach	Kokanee Escapement	
	Oct 12	Oct 13
Ole Creek		600
Constructed Channel	500	
Spawning Estimate*	1,150	1,380

* Estimate uses a 2.3 multiplier (Graves unpublished data, 1982)

No fork lengths were taken from kokanee within the Swift Bypass Reach in 2011 due to the low contributing numbers to the Yale population as a whole. If greater numbers of kokanee recruit to this area in the future, this data will be gathered and incorporated into the Cougar Creek data-set for comparison.

4.0 CONCLUSION

Kokanee spawning numbers in Cougar Creek remain low and below historical averages. In the past, decreases in the trend-line (especially due to stochastic events[1]) were quickly followed (within 2 to 3yrs.) by years of higher production as female size and fecundity increased presumably due to lack of competition for reservoir zooplankton. The spawner escapement numbers for the last seven years do not seem to be following this trend, as estimates remain low.

There are a number of factors that may be limiting kokanee escapement including but not limited to: predation, low reservoir productivity from water turbidity, lack of access to quality spawning habitat in Cougar Creek due to the numerous logjams, harvest, disease, and competition. It is difficult to quantify each factor and its specific effect on kokanee escapement. However, it is clear that kokanee escapement is much lower in recent years when compared to historical records and the exact cause(s) is yet to be determined.

The significance of the Lewis River Bypass Reach flows in reducing the number of kokanee returning to Cougar Creek is a permanent effect of habitat improvement and re-establishment of flows into the channel. The increase in available spawning habitat provides additional benefits to the kokanee population as a whole. Increased surveys of this area are planned to begin in 2011 per the Washington Department of Ecology's 401 Certification for the Lewis River hydroelectric projects.

[1] Mt. St. Helen's eruption in 1980 affecting the spawner escapement in 1982/1983 and the 100-year flood event in 1996 affecting the spawner escapement in 1998

Table 3. Summary of data collected from Cougar Creek kokanee surveys from 1978 to 2011.

Spawn Year	Peak Count	Date	Estimated Escapement*	Moving Average	Number of Females**	Mean Length (mm) Females	Mean Fecundity+	Total Eggs	Egg-to-Adult % Survival^
1978	32,064		73,747	35,930	36,874	325	582	21,468,547	
1979	26,136		60,113	66,930	30,056	300	515	15,485,658	
1980	54,782		125,999	86,620	62,999	275	448	28,237,546	
1981	25,614		58,912	79,693	29,456	300	515	15,176,372	0.27
1982	5,750		13,225	66,399	6,613	375	716	4,736,005	0.09
1983	2,875		6,613	56,435	3,306	359	673	2,226,230	0.02
1984	9,915		22,805	51,630	11,402	329	593	6,760,850	0.15
1985	25,623	25-Sep-85	58,933	52,543	29,466	294	499	14,707,884	1.24
1986	47,680	10-Oct-86	109,664	58,890	54,832	264	419	22,960,352	4.93
1987	63,406	30-Sep-87	145,834	67,584	72,917	242	360	26,234,042	2.16
1988	66,865	3-Oct-88	153,790	75,421	76,895	254	392	30,138,128	1.05
1989	44,199	11-Oct-89	101,658	77,608	50,829	284	472	24,008,499	0.44
1990	47,859	9-Oct-90	110,076	80,105	55,038	270	435	23,931,558	0.42
1991	81,993	7-Oct-91	188,584	87,854	94,292	256	397	37,462,192	0.63
1992	54,801	2-Oct-92	126,042	90,400	63,021	260	408	25,713,890	0.52
1993	78,260	6-Oct-93	179,998	95,999	89,999	259	405	36,480,195	0.75
1994	49,830	21-Sep-94	114,609	97,094	57,305	269	432	24,763,567	0.31
1995	12,590	12-Oct-95	28,957	93,309	14,479	287	480	6,955,182	0.11
1996	14,508	9-Oct-96	33,368	90,154	16,684	284	472	7,880,615	0.09
1997	8,169	23-Oct-97	18,789	86,586	9,394	308	537	5,041,572	0.08
1998	2,435	6-Oct-98	5,601	82,729	2,800	308	537	1,502,782	0.08
1999	8,260	22-Oct-00	18,998	79,832	9,499	281	464	4,410,386	0.24
2000	21,495	13-Oct-00	49,439	78,511	24,719	308	537	13,265,833	0.98
2001	20,611	24-Sep-01	47,405	77,215	23,703	309	539	12,783,787	3.15
2002	24,750	17-Oct-02	56,925	76,403	28,463	290	488	13,901,654	1.29
2003	38,004	9-Oct-03	87,409	76,827	43,705	258	403	17,598,094	0.66
2004	6,964	8-Oct-04	16,017	74,574	8,009	299	513	4,104,728	0.13
2005	14,226	7-Oct-05	32,720	73,080	16,360	273	443	7,245,145	0.24
2006	11,383	23-Oct-06	26,181	71,462	13,090	254	392	5,130,671	0.15
2007	6,175	17-Oct-07	14,203	69,554	7,101	308	537	3,810,957	0.35
2008	6,780	3-Oct-08	15,594	67,813	7,797	328	590	4,602,257	0.22
2009	11,075	29-Sep-09	25,473	66,490	12,736	286	478	6,084,107	0.50
2010	8,030	4-Oct-10	18,469	65,035	9,235	303	523	4,832,044	0.48
2011	19,610	10/11/2011	45,103	64,449	22,552	254.9	394	8,893,229	0.98
MEAN	**28,021**		**64,449**	**74,740**	**32,224**	**290**	**488**	**14,368,663**	

***Peak Count x 2.3 (Graves unpublished data, 1983)**
****Assuming a 1:1 ratio**
+ From the model: Fecundity = -288.78 + 2.68 x Length of Females (Graves unpublished data, 1983)
^ Estimated Escapement of Adults (3 year-olds) / estimated number of eggs

Attachment K
Aquatic Fund Project Close-Out Report

Lewis River Aquatic Fund Projects (SA 7.5.3.2)
Project Closeout Report

Project Title:	**Lewis River Hydroelectric Project** **North Fork Lewis River (RM 13.5) Habitat Enhancement**
Project Approved By:	Aquatic Coordination Committee 4/15/2009
Original Project Sponsor:	USDA Forest Service
Project Funding	$190,000
Project Description (work completed):	Historically, the Lewis River watershed was severely impacted by logging, gravel mining, residential development, blockage of LWD transport due to dams and flow regulation. These impacts have reduced LWD loading, channel complexity, the development of side-channels/off-channels and reduced habitat-forming processes (e.g. floods) necessary for creating early rearing habitat for juvenile Chinook, Steelhead, and Coho that originate in the upstream reaches. During September of 2010, LCFEG hired Kysar-Koistenin Excavating, Inc. and within a four week period we successfully placed 4 main stem LWD structures and built 3 off-channel complexity jams along 2,000ft of the North Fork Lewis River (RM 13.5). LCFEG utilized ACC Funds to purchase of root-wad attached logs and assist in paying for contractor costs during this restoration project. In combination with support provided by Salmon Recovery Funding Board, the NF Lewis (RM 13.5) Habitat Enhancement Project has successfully enhanced nearly a half mile of stream bank with the placement of a total of 26 log complexity structures along the east bank of North Fork Lewis River. After project completion, we have observed a dramatic increase of slow velocity margin habitat which is critical to the rearing success of juvenile Fall Chinook. The placement of the log complexity structures effectively created in-stream velocity breaks and increased sorting of mobile gravels to provide future stable spawning areas for returning salmonid adults. Recent spawning surveys (2010/2011) by Washington Department of Fish and Wildlife (WDFW) have enumerated an increase of Fall Chinook, steelhead and Coho spawning activity along the project reach, in addition to observing large schools of salmonid juveniles congregating around LWD structures. Due to the support provided by ACC Funds, this project has successfully enhanced early rearing habitat for Chinook in addition to improving spawning, rearing, and adult holding habitat for all salmonid species.

Workforce:

- **Personnel (by craft)**

Tony Meyer, LCFEG Executive Director
Tammy Weisman, LCFEG Operations Manager
Peter Barber, LCFEG Project Manager
Glen Saastad, LCFEG Crew Supervisor
Gardner Johnston, Engineer/Biologist Interfluve, Inc.
Mike McAllister, Engineer Interfluve, Inc.

- **Contractors:**

James Koistenin, Owner/operator Kysar-Koistenin Excavating, Inc.

Schedule Summary:

Planned Completion Date: 10/1/2010
Actual Completion Date: 10/1/2010

Problems Encountered:

None.

Things that went well:

- Minimal of amount of turbidity created during the wood installation.
- Observed immediate fish utilization post construction.
- Received a large wood donation of reservoir wood collected by Pacific Power.

Work Not Completed:

- Encountered delays in completing riparian restoration activities due to access to the project due to encountering high water during in the Fall/Winter. We plan to have the entire project site planted during Fall/Winter of 2011/12.

Lessons Learned:

*** Attachments (Photo Documentation):**

See attached.

*(Per National Marine Fisheries Service's Biological Opinion for Relicensing of the Lewis River Hydroelectric Projects):

Identify process or methodology the project will include and provide photo documentation of habitat conditions at the project site **before, during, and after** project completion.

a. Include general views and close-ups showing details of the project and project area, including pre- and post-construction.
b. Label each photo with date, time, project name, photographer's name, and documentation of the subject activity.

August 2010. Lewis River off-channel restoration.

September 2010. Lewis River off-channel construction.

Oct. 2010. Lewis River (RM 13.5) Off-channel post-construction

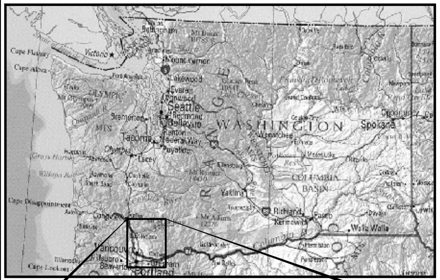
Jan. 2011. High water Lewis River (RM 13.5)

Aug. 2010 Lewis River main stem (RM 13.5)

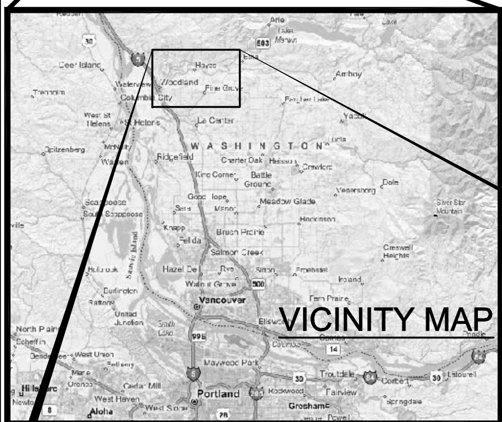
Oct. 2010. Lewis River main stem post construction

NF Lewis River (RM 13.5) Complexity log structure, Coho redd 10/6 /2011

LEWIS RIVER (RIVER MILE 13-14)
HABITAT ENHANCEMENT PROJECT
WOODLAND, WA



WASHINGTON STATE



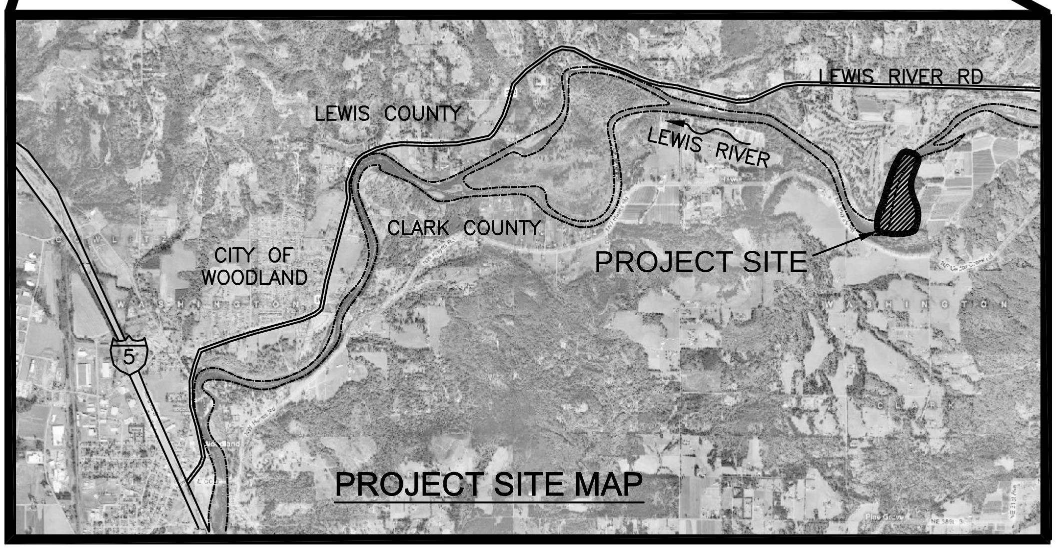
CLARK & LEWIS COUNTIES

WATERBODY: LEWIS RIVER
TRIBUTARY OF: COLUMBIA RIVER

NW1/4 & SW1/4 SECTION 11, T5N R1E
TAX PARCEL 252866000

COORDINATES
LATITUDE 45° 55' 52" N
LONGITUDE 122° 39' 14" W

N



PROPERTY OWNER
SAM KYSAR
2600 NE CEDAR CREEK RD
WOODLAND, WA 98674

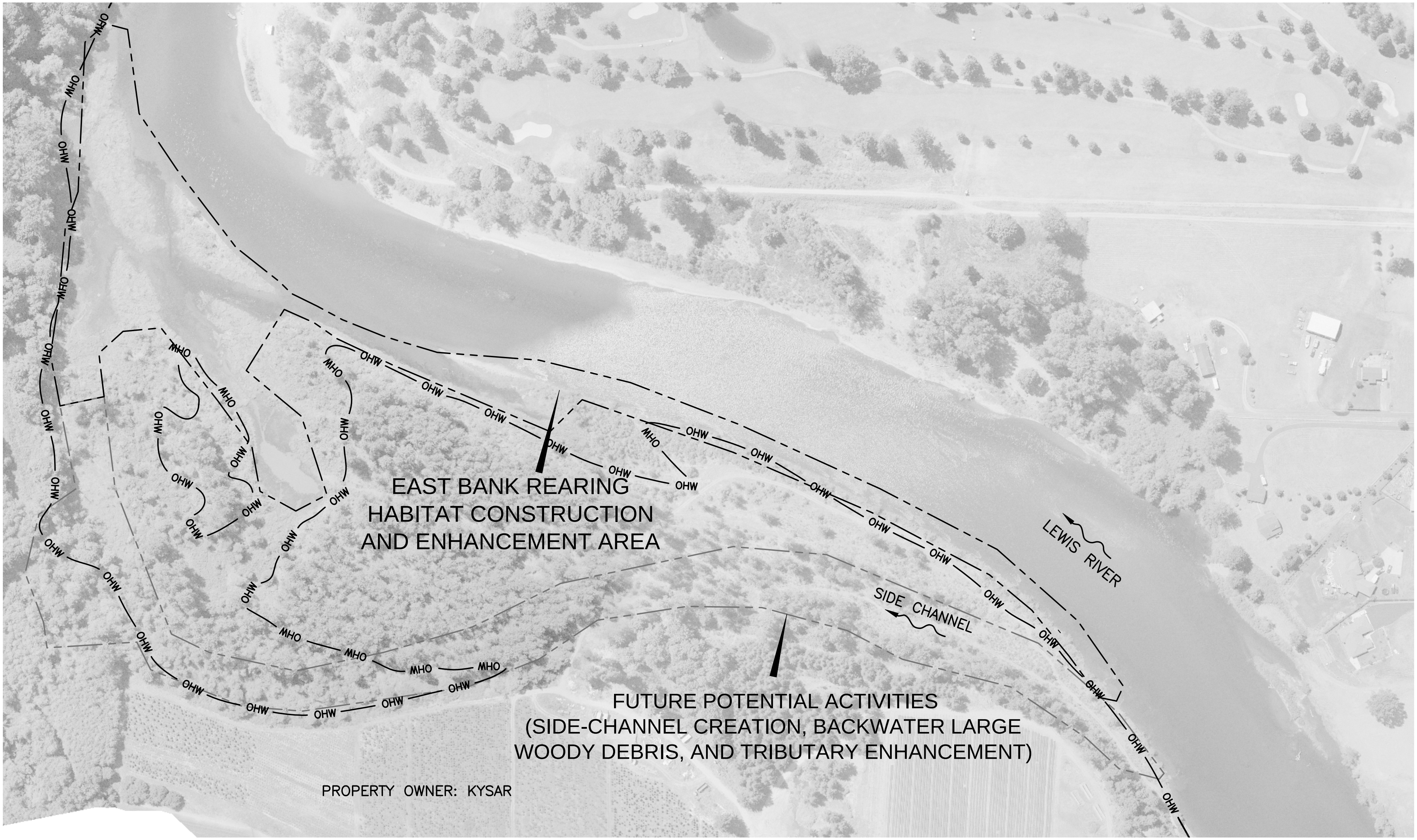
PROJECT PROPOSED BY
LOWER COLUMBIA FISH ENHANCEMENT GROUP

inter·fluve Inc.
1020 Wasco St., Suite 1
Hood River, OR 97031
541.386.9003
www.interfluve.com

SHEET INDEX

1. COVER, SHEET INDEX AND VICINITY MAP
2. PROJECT SITES AND PHASES, AERIAL VIEW
3. EXISTING CONDITIONS, PLAN VIEW
4. PROPOSED EAST BANK REARING HABITAT SITES, PLAN VIEW
5. PROPOSED EAST BANK REARING HABITAT, DETAILS
6. LOG AND BOULDER CABLING DETAILS

LEWIS RIVER (RIVER MILE 13-14) HABITAT ENHANCEMENT PROJECT	COVER, SITE MAP, SHEET INDEX	PURPOSE: HABITAT DATUM: N/A ADJACENT PROPERTY OWNERS: SEE SHEET 2	NAME: KYSAR REFERENCE #: 008409-09-01 SITE LOCATION ADDRESS: 2600 NE CEDAR CREEK RD.	PROPOSED: HABITAT ENHANCEMENT ALONG: LEWIS RIVER NEAR: WOODLAND COUNTY: CLARK STATE: WA DATE: JANUARY 27, 2010 SHEET 1 OF 6



LEGEND

- PROJECT AREA
- FUTURE POTENTIAL ACTIVITIES
- OHW — ORDINARY HIGH WATER LINE

POTENTIAL FUTURE PHASES ARE INCLUDED ONLY TO PROVIDE CONTEXT.

PROJECT SITE MAP

N

0 300 600

PLAN SCALE IN FEET

LEWIS RIVER (RIVER MILE 13-14)
HABITAT ENHANCEMENT PROJECT

AERIAL VIEW
PROJECT SITES & PHASES

LOWER COLUMBIA FISH ENHANCEMENT GROUP

inter·fluve inc.
1020 Wasco St., Suite 1
Hood River, OR 97031
541.386.9003
www.interfluve.com

REFERENCE: 008409-09-01
APPLICANT: LCFEG
PROPOSED: HABITAT ENHANCEMENT
NEAR: WOODLAND, WA

DATE: JANUARY 27, 2010

SHEET 2 OF 6

PLAN VIEW

0 300 600
PLAN SCALE IN FEET

LEGEND

EXISTING GROUND CONTOUR

PROJECT AREA

OHW ORDINARY HIGH WATER LINE

LEWIS RIVER (RIVER MILE 13-14)
HABITAT ENHANCEMENT PROJECT

EXISTING CONDITIONS
PLAN VIEW

LOWER COLUMBIA FISH ENHANCEMENT GROUP

inter·fluve Inc.
1020 Wasco St., Suite 1
Hood River, OR 97031
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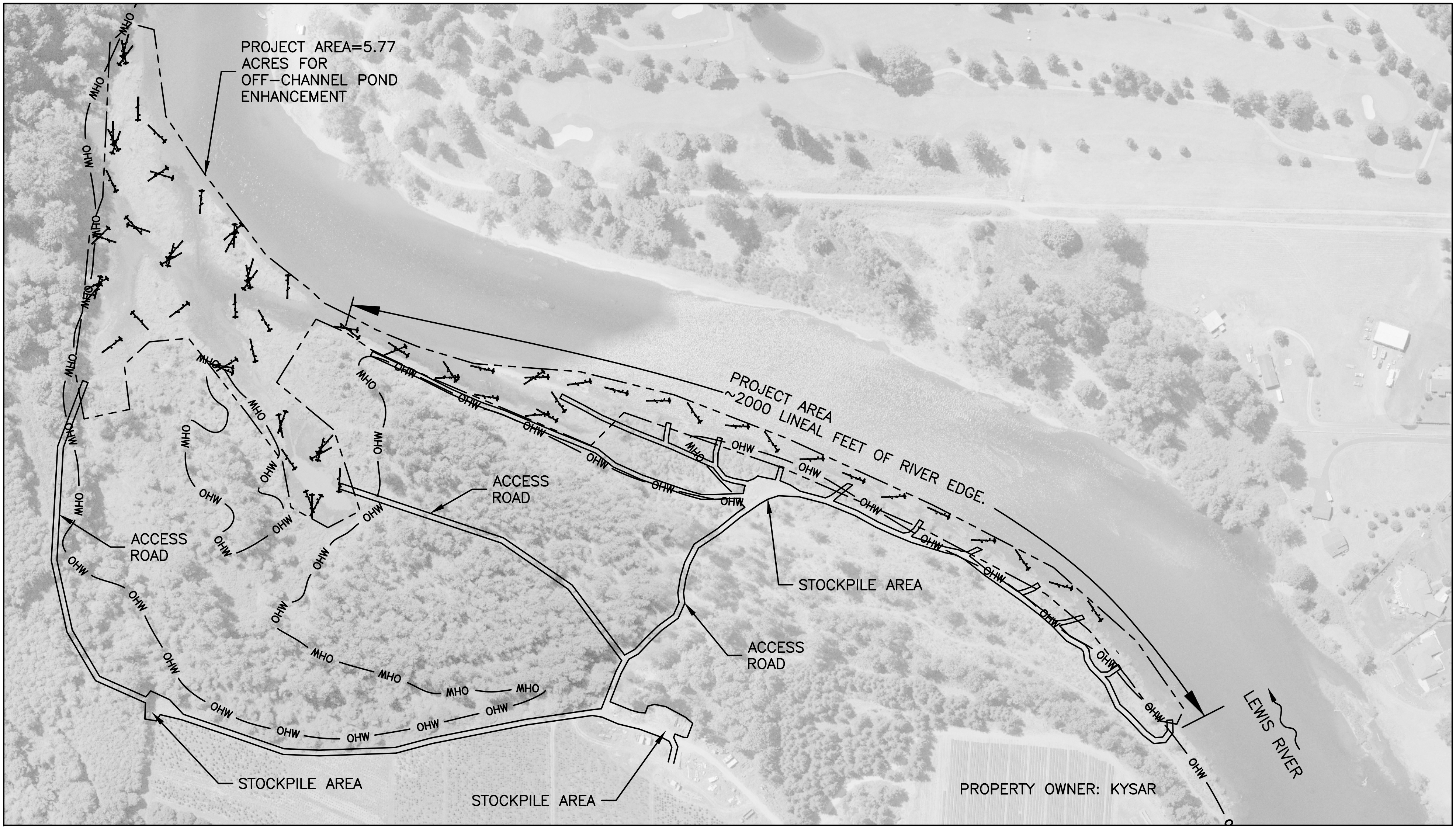
www.interfluve.com

REFERENCE: 008409-09-01
APPLICANT: LCFEG
PROPOSED: HABITAT ENHANCEMENT
NEAR: WOODLAND, WA

DATE: JANUARY 27, 2010

SHEET 3 OF 6



PLAN VIEW

LEGEND

PROJECT AREA

ORDINARY HIGH WATER LINE

WOOD PLACEMENTS

0 300 600

PLAN SCALE IN FEET

TOTAL DISTURBANCE AREA = 8.78 AC
ACTIVITY WITHIN OHW = 8.51 AC

FILL WITHIN OHW
WOOD: 880 CY (184 LOGS)
BOULDERS: 230 CY

LEWIS RIVER (RIVER MILE 13-14) HABITAT ENHANCEMENT PROJECT	EAST BANK PROPOSED REARING HABITAT SITES PLAN VIEW	LOWER COLUMBIA FISH ENHANCEMENT GROUP	inter·fluve inc. 1020 Wasco St., Suite 1 Hood River, OR 97031 541.386.9003 www.interfluve.com	REFERENCE: 008409–09–01 APPLICANT: LCFEG PROPOSED: HABITAT ENHANCEMENT NEAR: WOODLAND, WA DATE: JANUARY 27, 2010 SHEET 4 OF 6

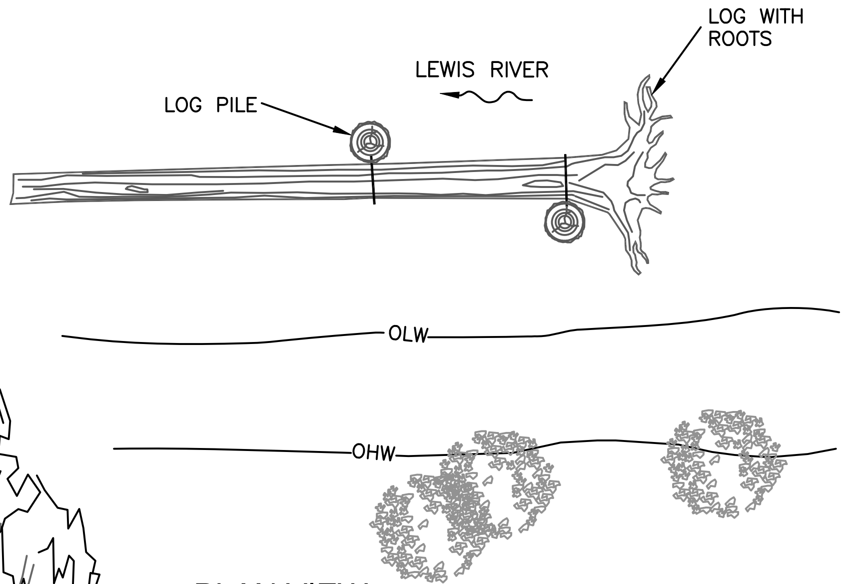
NOTES:

DETAILS ARE APPROXIMATE. ACTUAL CONFIGURATIONS AND MATERIAL QUANTITIES FOR EACH LOG JAM WILL BE DETERMINED IN THE FIELD BASED ON THE SPECIFIC SIZE AND DIMENSIONS OF ACQUIRED MATERIALS.

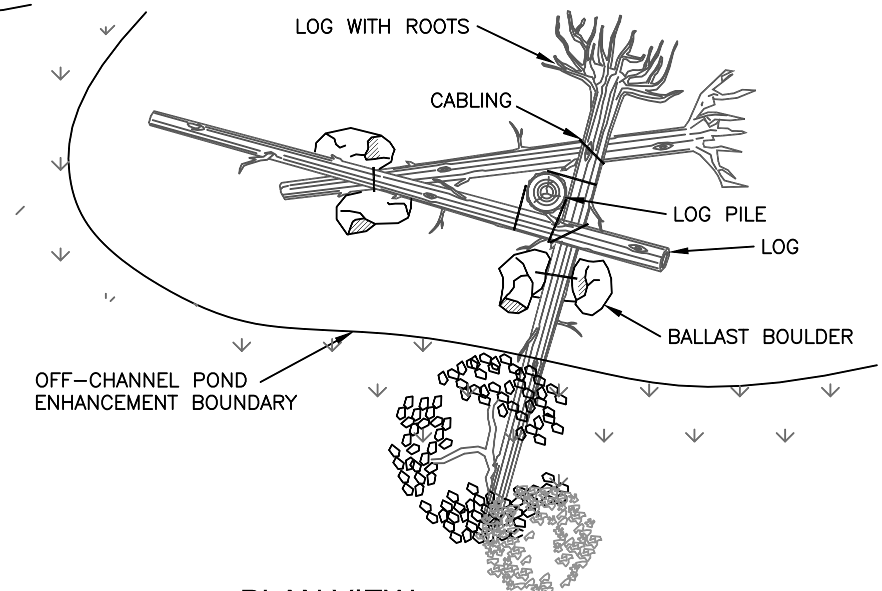
BALLAST REQUIREMENTS WILL BE DETERMINED ON A PER EACH BASIS FOR KEY PIECE LOGS. FOR ESTIMATING PURPOSES, A 40' LONG 24" DBH D.FIR WITH ROOTS REQUIRES 2.5 TONS OF BUOYANCY RESISTANCE THAT CAN BE PROVIDED BY COMPLETE OR PARTIAL BURIAL OF LOGS, OR CABLING TO BALLAST BOULDERS, PILES (SNAGS), OR EXISTING TREES. (4 TONS DRY BOULDERS PROVIDE 2.5 TONS BALLAST WHEN SUBMERGED).

BRACING TO EXISTING TREES OR INSTALLED VERTICAL LOGS WILL OCCUR AT LOCATIONS IDENTIFIED IN THE FIELD TO PROVIDE HORIZONTAL STABILITY.

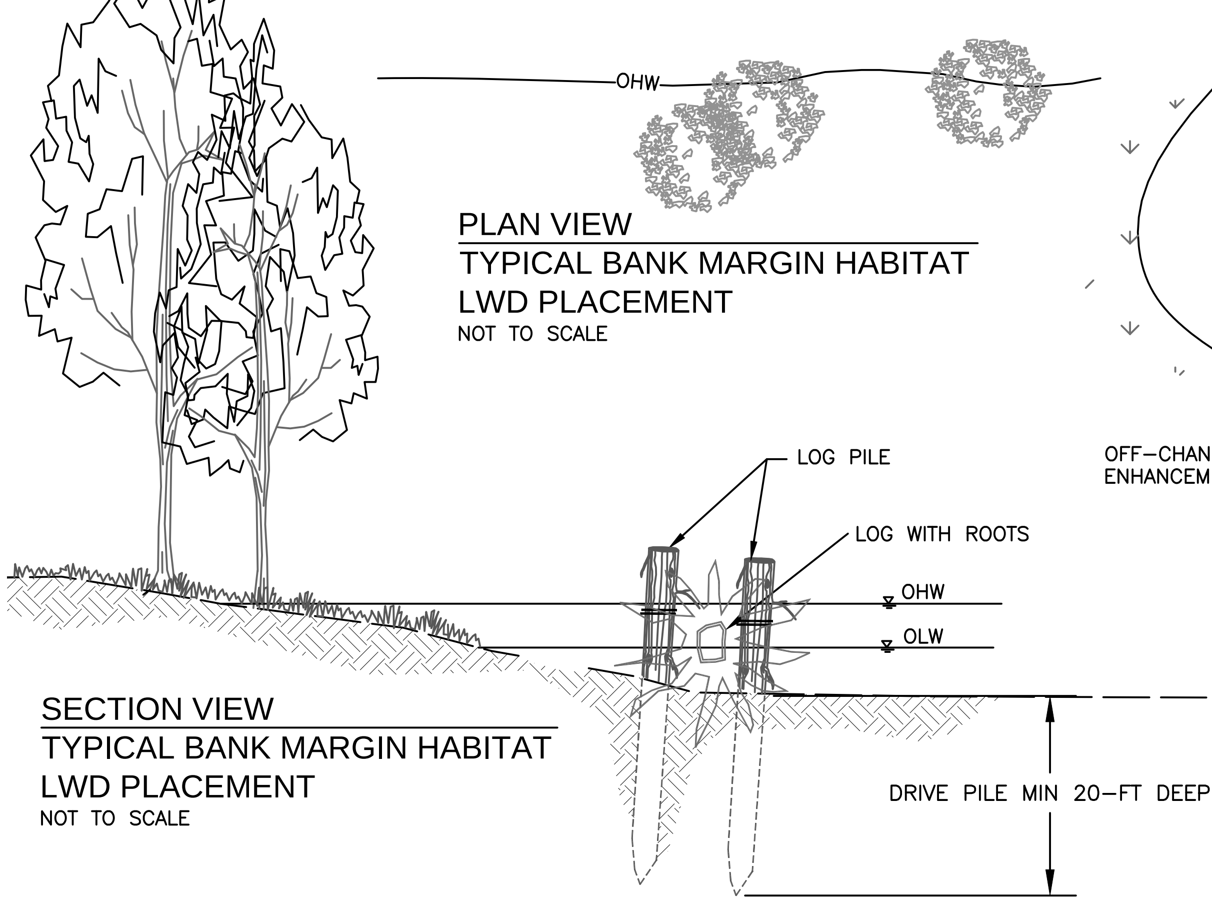
FILLER LOGS AND TREE TOPS MAY BE INSTALLED AT "RACKIING" LOCATIONS TO EMULATE NATURAL DEBRIS ACCUMULATIONS AND TO OPTIMIZE FISH HABITAT. THESE PIECES ARE TO BE CONSIDERED MOBILE AND TRANSIENT, AND AS SUCH MAY BECOME LOOSE, DISPLACED, DISLODGED, OR ACCUMULATED ONTO DURING FLOODING.



PLAN VIEW
TYPICAL BANK MARGIN HABITAT LWD PLACEMENT
NOT TO SCALE

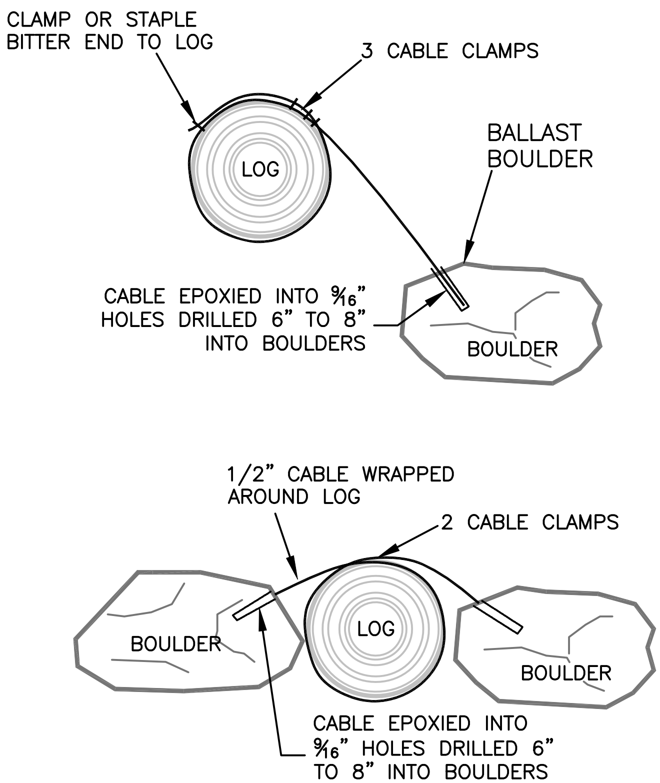


PLAN VIEW
TYPICAL OFF-CHANNEL HABITAT LWD PLACEMENT
NOT TO SCALE



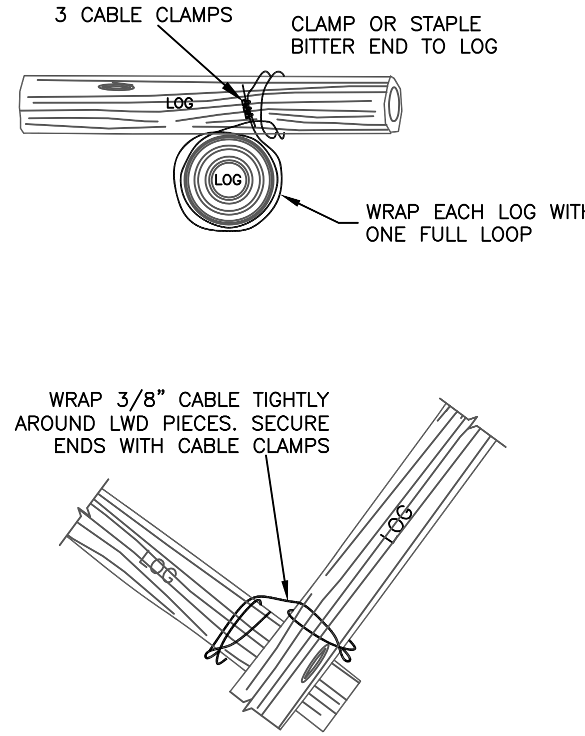
SECTION VIEW
TYPICAL BANK MARGIN HABITAT LWD PLACEMENT
NOT TO SCALE

LEWIS RIVER (RIVER MILE 13-14) HABITAT ENHANCEMENT PROJECT	EAST BANK CONSTRUCTED REARING HABITAT DETAIL VIEWS	LOWER COLUMBIA FISH ENHANCEMENT GROUP	inter·fluve Inc. 1020 Wasco St., Suite 1 Hood River, OR 97031 541.386.9003 www.interfluve.com	REFERENCE: 008409–09–01 APPLICANT: LCFEG PROPOSED: HABITAT ENHANCEMENT NEAR: WOODLAND, WA DATE: JANUARY 27, 2010 SHEET 5 OF 6



LOG-BOULDER CABLING DETAILS

NO SCALE



LOG-LOG CABLING DETAILS

NO SCALE

CABLING IS DEPICTED HERE, BUT OTHER METHODS FOR SECURING LOGS MAY BE USED AS DIRECTED BY THE ENGINEER. SUCH METHODS INCLUDE BUT ARE NOT LIMITED TO CHAINING OR THREADED ROD & BOLT.

LEWIS RIVER (RIVER MILE 13-14) HABITAT ENHANCEMENT PROJECT	CABLING DETAILS	LOWER COLUMBIA FISH ENHANCEMENT GROUP inter·fluve Inc. 1020 Wasco St., Suite 1 Hood River, OR 97031 541.386.9003 www.interfluve.com	REFERENCE: 008409-09-01 APPLICANT: LCFEG PROPOSED: HABITAT ENHANCEMENT NEAR: WOODLAND, WA DATE: JANUARY 27, 2010 SHEET 6 OF 6

Attachment L
Cowlitz PUD Water Quality Appendices

APPENDIX A

Water Temperature Monitoring QA/QC Procedure

The Onset Corporation Stowaway TidbiT® thermographs used in this monitoring program have an accuracy of 0.2°C and a resolution of 0.16°C (at 0 to 50°C). Procedures used for calibration, inspection, and maintenance of the thermographs, and data collections using the thermographs are closely based on manufacturer instructions and on the thermograph deployment procedures described in *Continuous Temperature Sampling Protocols for the Environmental Monitoring and Trends Section* (Ward 2003).

Prior to the initial deployment, each thermograph is subject to a calibration check using a hand-held Certified Reference Thermometer traceable to the National Institute of Standards and Technology[9]. During the pre-deployment check, any thermograph having a mean absolute value difference greater than 0.2°C is rejected until the problem is corrected and the instrument passes another calibration check (Ward 2003).

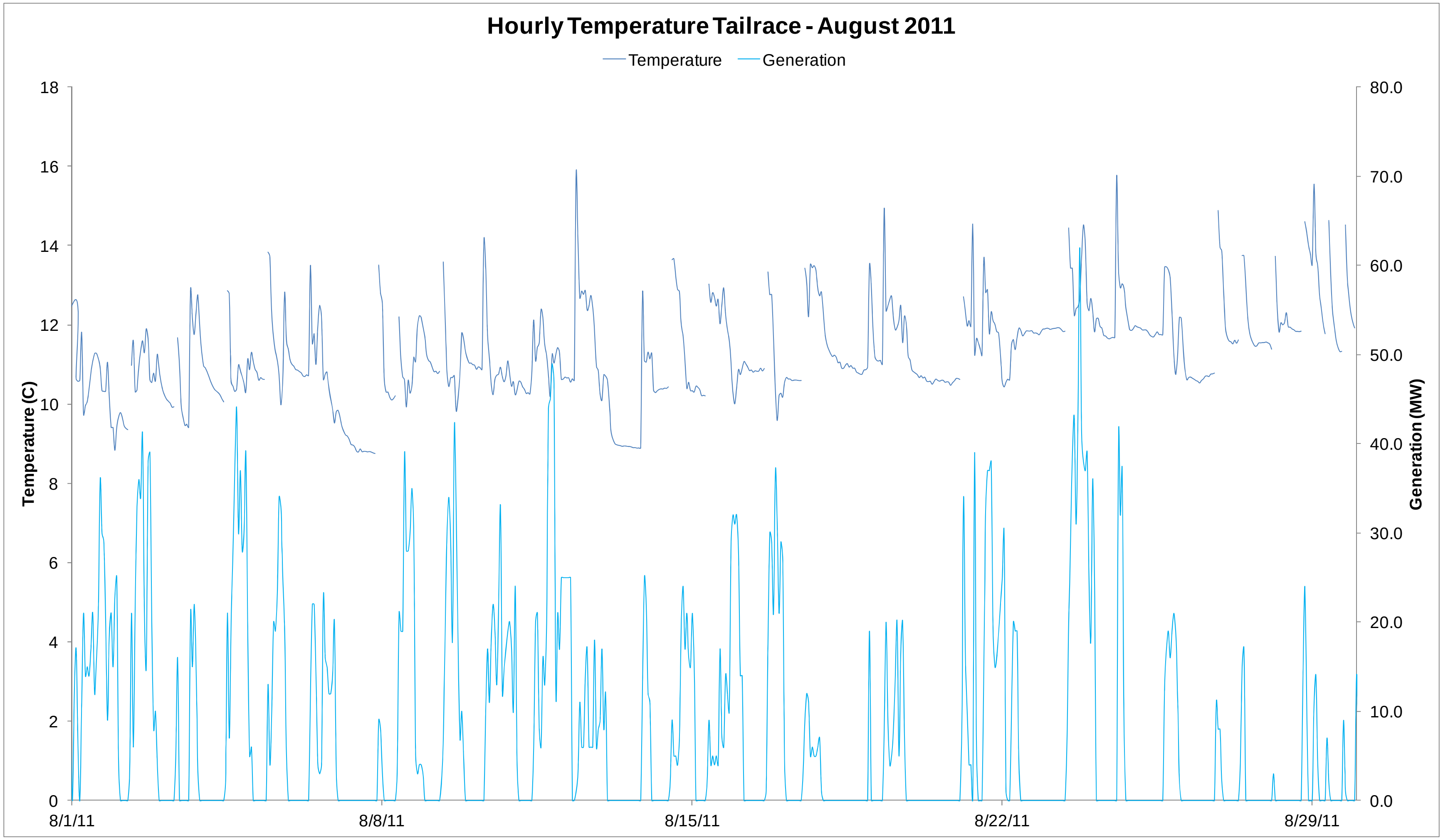
When feasible, calibration checks are also conducted during field servicing of the thermographs (using a hand-held thermometer). Calibration checks are used to document bias and performance to assure the quality of the data. All thermographs are serviced and data downloaded approximately monthly. Prior to downloading, the thermographs are gently cleaned to remove any biofouling or sediment that would potentially affect their ability to communicate optically during the downloading process.

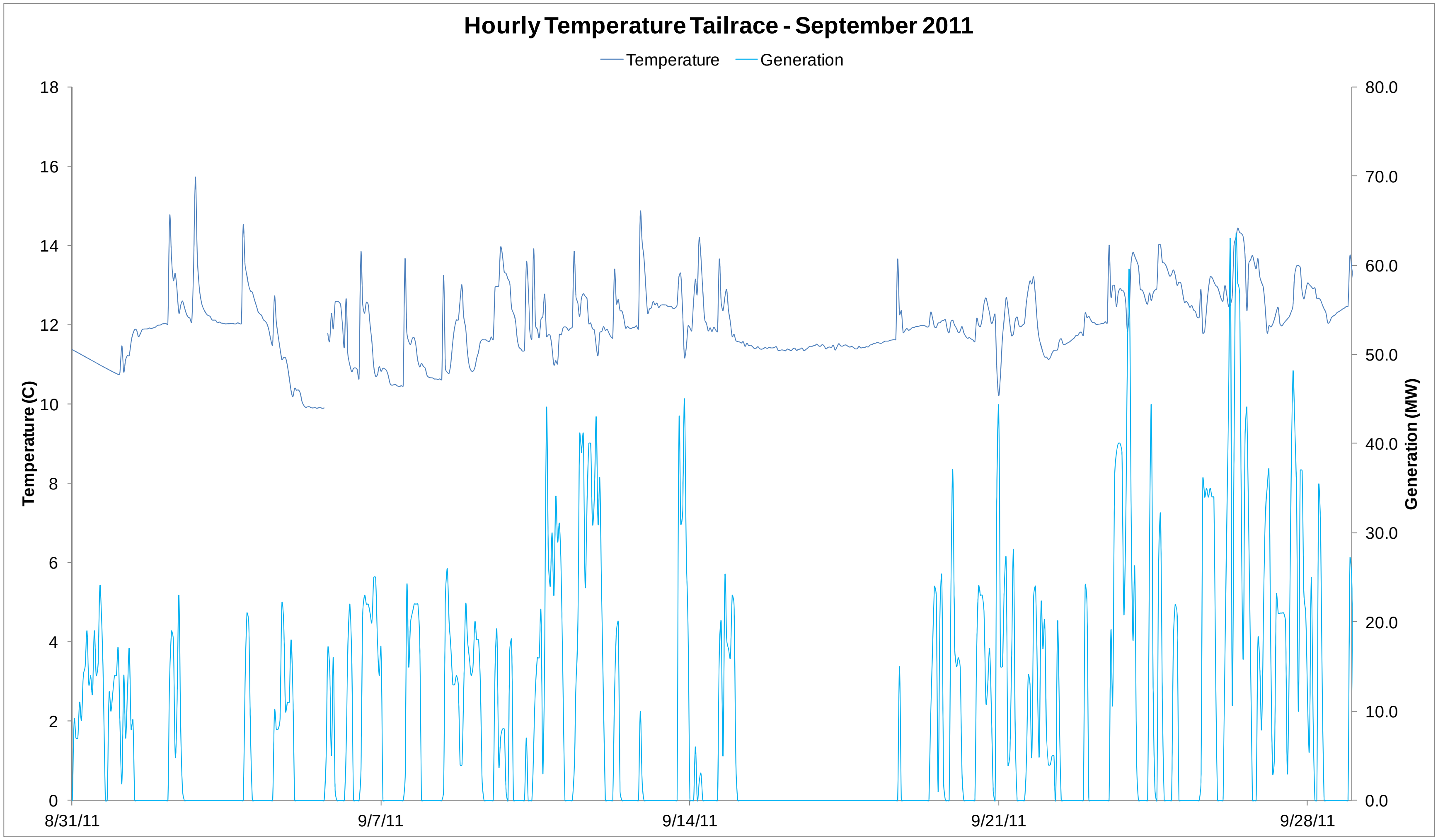
A post-deployment thermograph calibration check is also completed at the end of each monitoring period using the same methods employed during the pre-deployment calibration check. If a thermograph fails a post-sampling calibration check, then another calibration check is performed. If it fails a second calibration check, the raw data is adjusted by the mean difference of the pre-and post-calibration check results to correct for the instrument bias (Ward 2003).

All downloaded data is transferred to a Microsoft Excel database and anomalous data collected during each monitoring period is identified by reviewing plots of the water temperature results and by comparing any questionable results to ambient temperature data, flow and/or generation information, and field notes. Identified data anomalies then may be deleted from the record, provided the reason has been noted in the report. Erroneous readings that can be traced to equipment failure result in rejection of the data.

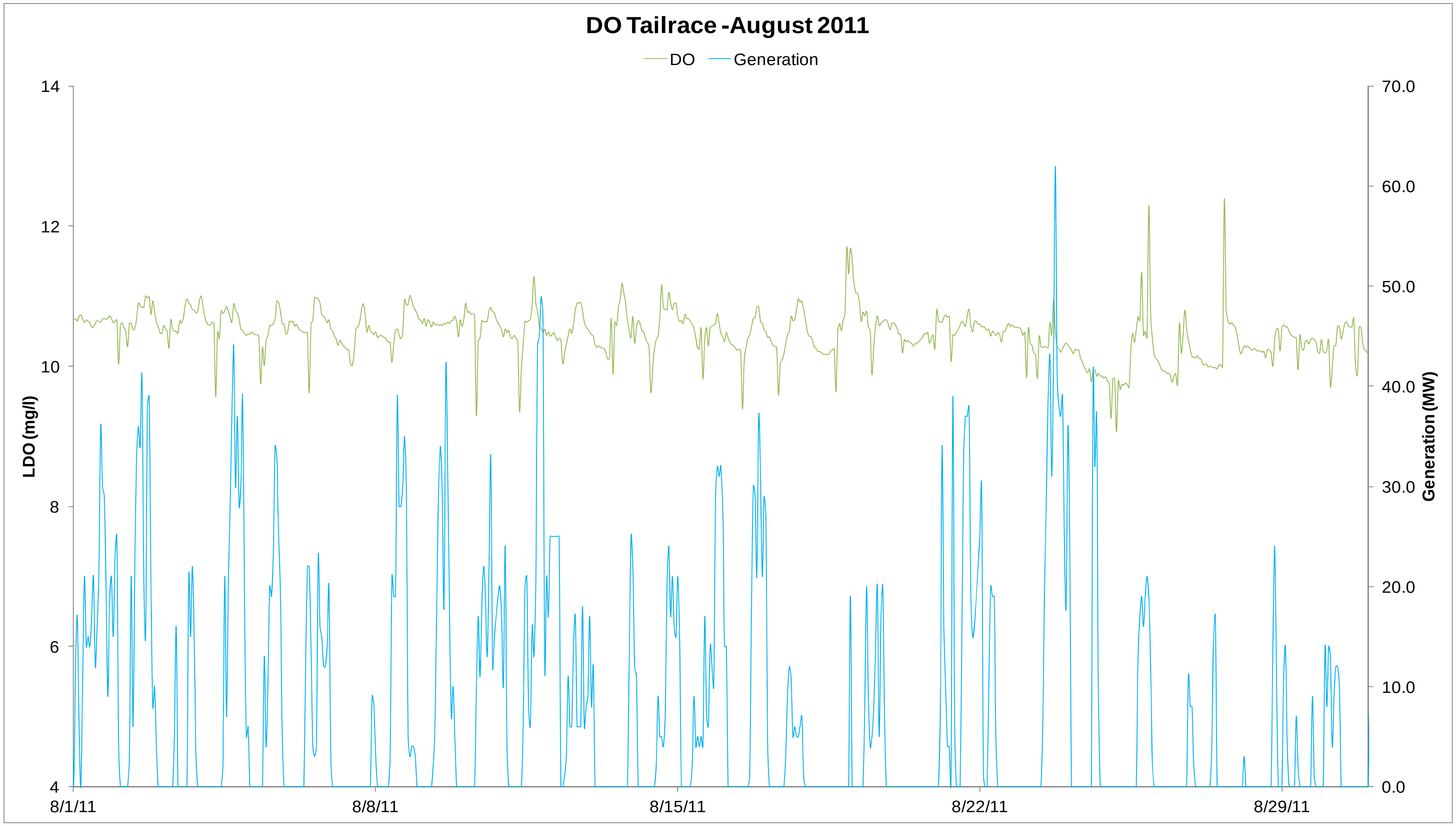
[9] Brooklyn Thermometer Company, Inc., Reference NIST Test No. 272630-06.

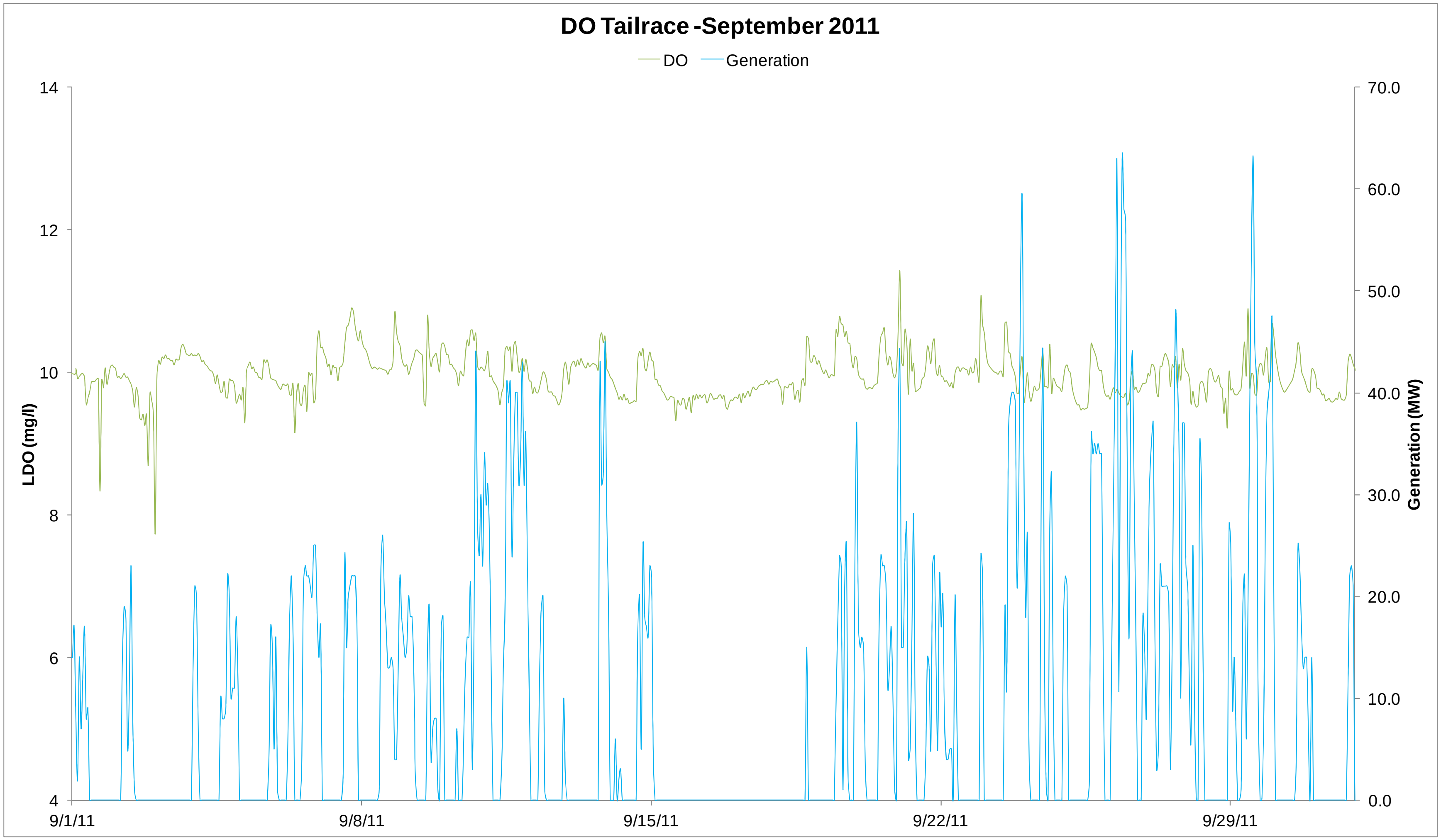
APPENDIX B


Hourly Temperature Tailrace - August 2011
Temperature
Generation
Temperature (C)
Generation (MW)
18
16
14
12
10
8
6
4
2
0
80.0
70.0
60.0
50.0
40.0
30.0
20.0
10.0
0.0
8/1/11
8/8/11
8/15/11
8/22/11
8/29/11


Hourly Temperature Tailrace - September 2011
Temperature
Generation
Temperature (C)
Generation (MW)
18
16
14
12
10
8
6
4
2
0
80.0
70.0
60.0
50.0
40.0
30.0
20.0
10.0
0.0
8/31/11
9/7/11
9/14/11
9/21/11
9/28/11

APPENDIX C


DO Tailrace -August 2011
DO
Generation
LDO (mg/l)
Generation (MW)
14
12
10
8
6
4
70.0
60.0
50.0
40.0
30.0
20.0
10.0
0.0
8/1/11
8/8/11
8/15/11
8/22/11
8/29/11


DO Tailrace -September 2011
DO
Generation
LDO (mg/l)
Generation (MW)
14
12
10
8
6
4
70.0
60.0
50.0
40.0
30.0
20.0
10.0
0.0
9/1/11
9/8/11
9/15/11
9/22/11
9/29/11

Attachment M

Lewis River Wildlife Habitat Management Plan 2012 Annual Plan

Attachment M is saved as a separate file.

Attachment N

Lewis River Wildlife Habitat Management Plan 2011 Annual Report

Attachment N is saved as a separate file.

Attachment O
Road Maintenance and Abandonment Plan

PacifiCorp Energy
2011
Road Maintenance & Abandonment
Work Completed for Merwin, Yale & Swift

Background

The Washington State Legislature directed the state Forest Practices Board through the Salmon Recovery Act, 1999 Laws Sp. Sess. Ch. 4, to change forest practices rules relating to roads consistent with the April 29, 1999 Forests and Fish Report. This act was passed to provide substantial and sufficient contributions to salmon recovery and water quality enhancement, as well as, satisfy requirements of the federal Endangered Species Act and the federal Clean Water Act in forested areas.

Effective March 20, 2000, the Forest Practices (FP) Board adopted significant emergency changes and additions to the forest road construction and maintenance rules (Chapter 222-24 WAC, or current FP rules, or the rules). These emergency changes are designed to ensure that forest roads in Washington State meet standards recommended in the April 29, 1999 Forests and Fish Report, and requirements in the federal Endangered Species and Clean Water Acts.

Based on current FP rules, forest roads must be used and managed in a manner not to threaten public safety, and prevent potential or actual damage to public resources.

2011 Work Accomplished

PacifiCorp Energy completed two culvert improvement projects (non-fish), 5.0 miles (8.0 km) of road improvement and 0.5 miles (804.7 m) of road abandonment projects on the Lewis River hydroelectric projects.

During 2011, these additional projects were completed:

- RMAP plans (road, stream and culvert inventories) were completed for 2 properties (972 acres; 393.4 ha) acquired in 2010. This added 9.7 miles (15.6 km) of roads to management lands (attached).
- A complete inventory of PacifiCorp roads on Wildlife Habitat Management Area lands was inspected to identify status of previous road abandonment projects and unauthorized access.
- Schedules were identified for establishing new gates and road abandonment projects.

2012 Road Maintenance Activities

At least one undersized culvert and over 4.0 miles (6.4 km) of drainage ditch repairs are scheduled for upgrading on the recently acquired Management Unit 33 property. Repairs to shot-gun culvert outlets are also planned on one non-fish perennial stream and one non-fish seasonal stream. Two additional undersized culverts are scheduled to be replaced with larger culverts in Management Unit 16 on seasonal non-fish bearing streams to prevent erosion. Approximately four miles (6.4 km) of road are identified for abandonment and an additional nine road barriers (gates or boulders) are identified to reduce unauthorized public access

All of PacifiCorp Energy's roads are inspected annually to identify maintenance issues. Additionally, monitoring of previously managed sites will be conducted to ensure vegetation is establishing were necessary.

WASHINGTON STATE DEPARTMENT OF
Natural Resources

For DNR Region Office Use Only	
Region:	
Comment Due Date:	
Issued Date:	

RMAP ANNUAL ACCOMPLISHMENT AND PLANNING REPORT

PLEASE FOLLOW THE INSTRUCTIONS TO COMPLETE THIS FORM.
PLEASE TYPE OR PRINT IN INK.

Landowner Name: PACIFICORP ENERGY RMAP # R2900305

Landowner /Representative Signature: Kirk Naylor for Pacificorp Date: 1-13-12

RMAP Anniversary Date: 12/31 WRIA Number(s): 27

Mailing Address: Hydro Resources-Environmental Compliance, 825 NE Multnomah - Suite 1500

City: Portland State: Oregon Zip Code: 97232 Phone Number: 503-813-6619

Contact Person *(If Different from Above)*

Name: Kirk Naylor

Mailing Address: Same as above

City:_____ State: _____ Zip Code: _____ Phone Number: _____

RMAP Completion Year: 2021

☑ Please check if there have been any changes due to lands being purchased, sold, exchanged, etc. since your last annual report and describe the changes and show on maps.

Current RMAP Summary

How many acres within this plan: 11,105

Total length of your forest road(s) in this plan: 57.4 miles

Total length of orphan roads in this plan (roads and railroad grades not used since 1974): 3.1 miles

Total length of orphan road segments posing a risk to public safety or public resources: 0 miles

Total number of forest road related fish passage barriers: 10

Total length of forest road needing improvement or abandonment: 6.4 miles

Total road improvement complete by Road Management Block (RMB). Indicate percent complete.

RMB	% Road Improvement Complete	% Anadromous Fish Barriers Removed / Fixed (optional)
Merwin	99%	
Yale	60%	
Swift	20%	

Work Completed Since Last Annual Plan*

Total length of road improvement completed: .5 miles

Total length of road abandonment completed: .5 miles

Total length of orphan road abandonment and/or improvement completed: 0 miles

Total length of orphan road resource threat that has been mitigated: 0 miles

Total length of new roads added to the plan (purchase, land exchange, etc. since last annual report):

10.7 miles

Total number of fish passage barriers removed/fixed: 0

Approximate stream miles opened for fish passage: 0

Work Proposed for Upcoming Year's Work*

Total length of road to be improved: 3.9 miles

Total length of road to be abandoned: 0 miles

Total length of orphan road to be abandoned and/or improved: 0 miles

Total number of fish passage barriers to be removed / fixed: 0

Accomplishment Scheduling Worksheet – indicate below how the information is provided:

Fish Barrier – Accomplishment Scheduling Worksheet and map required format from DNR

- ☐ Printed forms and maps required
- ☐ Electronic – spreadsheet
  - ☐ Spreadsheet that includes latitude and longitude – map may be required
  - ☐ Spreadsheet does not includes latitude and longitude – map required
- ☐ GIS shape file – must meet DNR standards – map may be required

Road Segments – Accomplishment Scheduling Worksheet OR landowner format that includes required information.

- ☐ Printed Accomplishment Scheduling Worksheet and map
- ☑ Electronic road segment spreadsheet and map
- ☐ GIS shapefile – must meet DNR standards - map may be required

***Maps must show location(s) of work accomplished in last year and work planned for the upcoming year.**

Additional Information (attach additional page(s) if necessary):

Installed one ditch culvert, one stream culvert and rocked .5 miles of road. Abandoned .5 miles of road.

Copies to: [ ] Landowner [ ] ECY Rep: ____________ [ ] DFW Rep: ____________
[ ] Tribal Rep(s): ____________; ____________; ____________ [ ] Other: ________

For DNR Region Office Use Only

Status [ ] Accepted
[ ] Not Acceptable – reason(s) for non-acceptance:

Changes Made since Last Report:

Issued By: ____________________ Date: ____________________

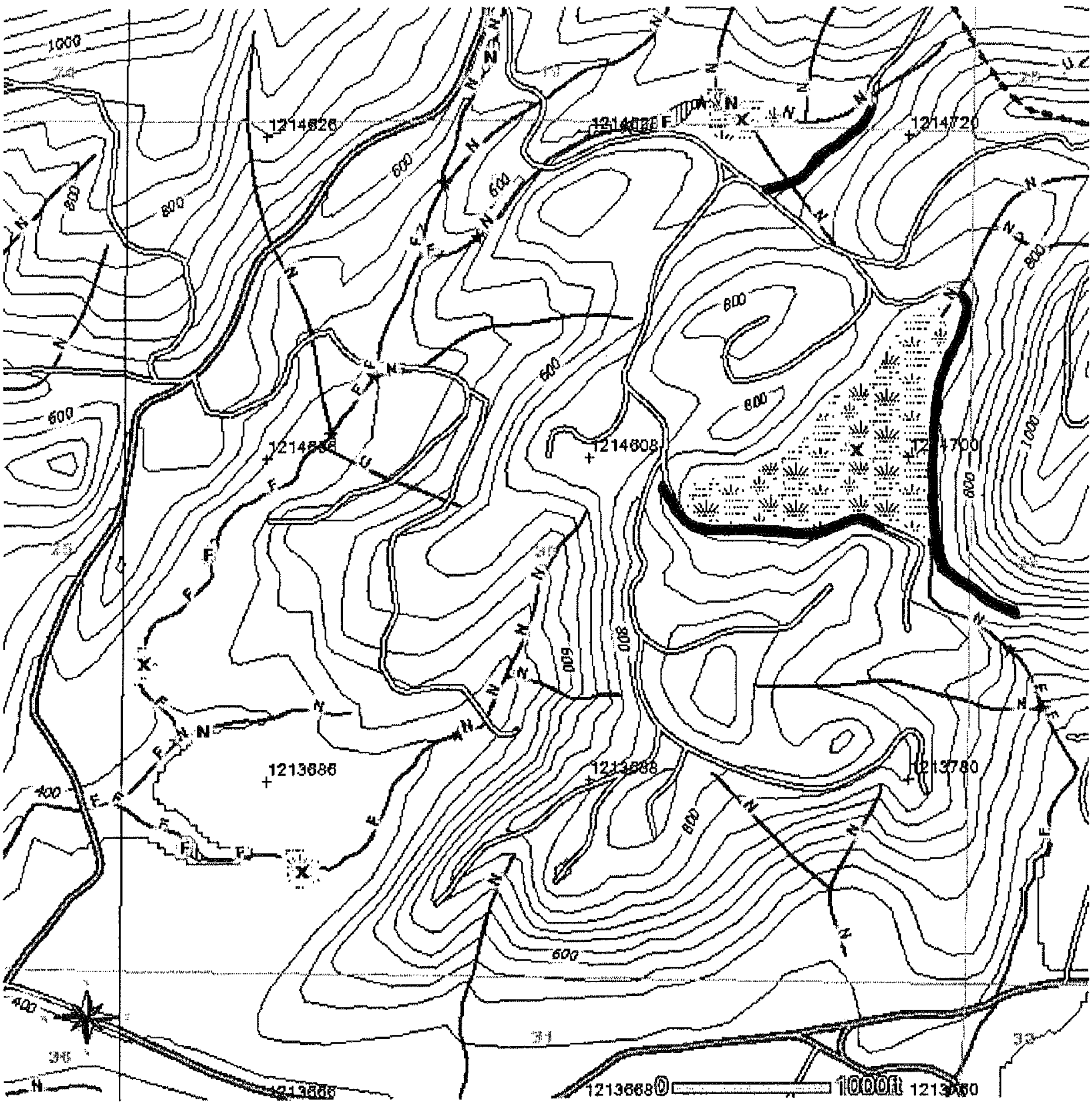
Status Copies to: [ ] Landowner [ ] ECY Rep: ____________ [ ] DFW Rep: ____________
[ ] Tribal Rep(s): ____________; ____________; ____________ [ ] Other: ________

FOREST PRACTICE ACTIVITY MAP

TOWNSHIP 6 NORTH HALF 0, RANGE 4 EAST (W.M.) HALF 0, SECTION 30

Application #:______________________________

Work Completed Since Last Annual Plan



Please use the legend from the FPA Instruction or provide a list of symbols used.

Road Work Completed

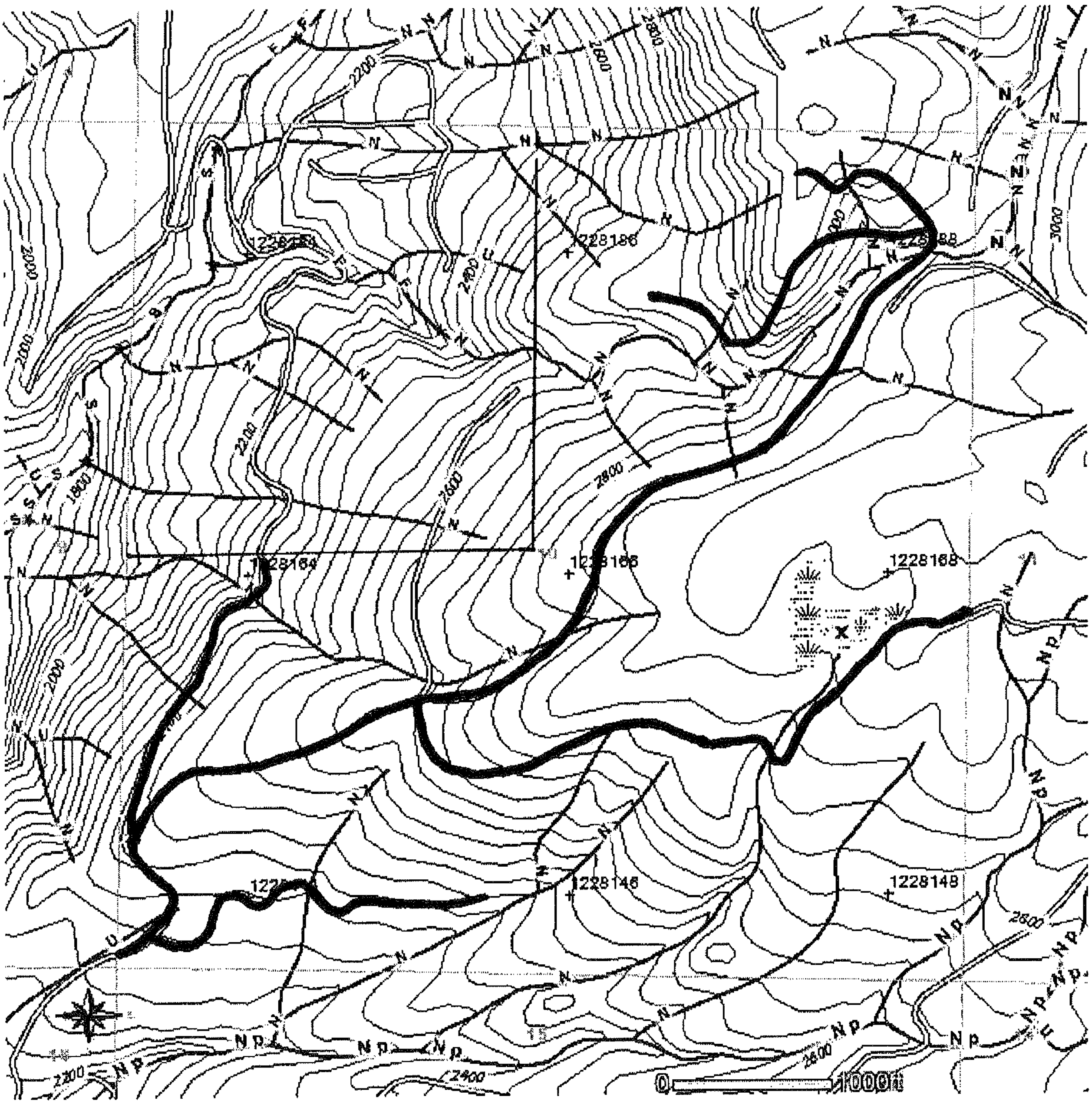
Friday, January 06, 2012 2:05:49 PM
NAD 83
Contour Interval: 40 Feet

FOREST PRACTICE ACTIVITY MAP

TOWNSHIP 7 NORTH HALF 0, RANGE 5 EAST (W.M.) HALF 0, SECTION 10

Application #:______________________________

Work Proposed for Upcoming Year



Please use the legend from the FPA Instruction or provide a list of symbols used.

Road Work Proposed

Friday, January 06, 2012 2:08:23 PM
NAD 83
Contour Interval: 40 Feet

Pacific Cascade Region
Road Maintenance and Abandonment Planning
Land Transaction Form

This space for office use.	
Date received: *Date GIS Complete:*	*Continuing Forest Land Obligations log number(s):*

This form may be used alone or in conjunction with a Forest Land Continuing Obligation form. However, it does not replace the Continuing Obligation form. It is specific to Pacific Cascade (PC) Region and will be used to maintain PC Region Road Maintenance and Abandonment Planning (RMAP) Program records. Contact the PC Region RMAP Coordinator or Forest Practices office if you have questions. The Pacific Cascade Region office number is (360) 577-2025.

Complete the applicable table(s) and attach updated property map(s):

☑ **Land Purchased**

1. Who did you buy forest land from?	**2.** Purchased property RMAP number(s) *If unknown, write 'unknown'.*	**3.** Number of acres in forest land sale	**4.** Number of forest road miles in sale	**5.** Number of forest road miles not up to Forest Practices standards	**6.** Number of fish blockages remaining to be opened	**7.** Will you follow the previous landowner's RMAP? *(yes, no, unsure)*
Longview Timberlands, LLC. Swift Creek	Unknown	479	5.1	Unknown	None	No
Longview Timberlands, LLC. Saddle Mountain	Unknown	492.7	4.6	Unknown	None	No

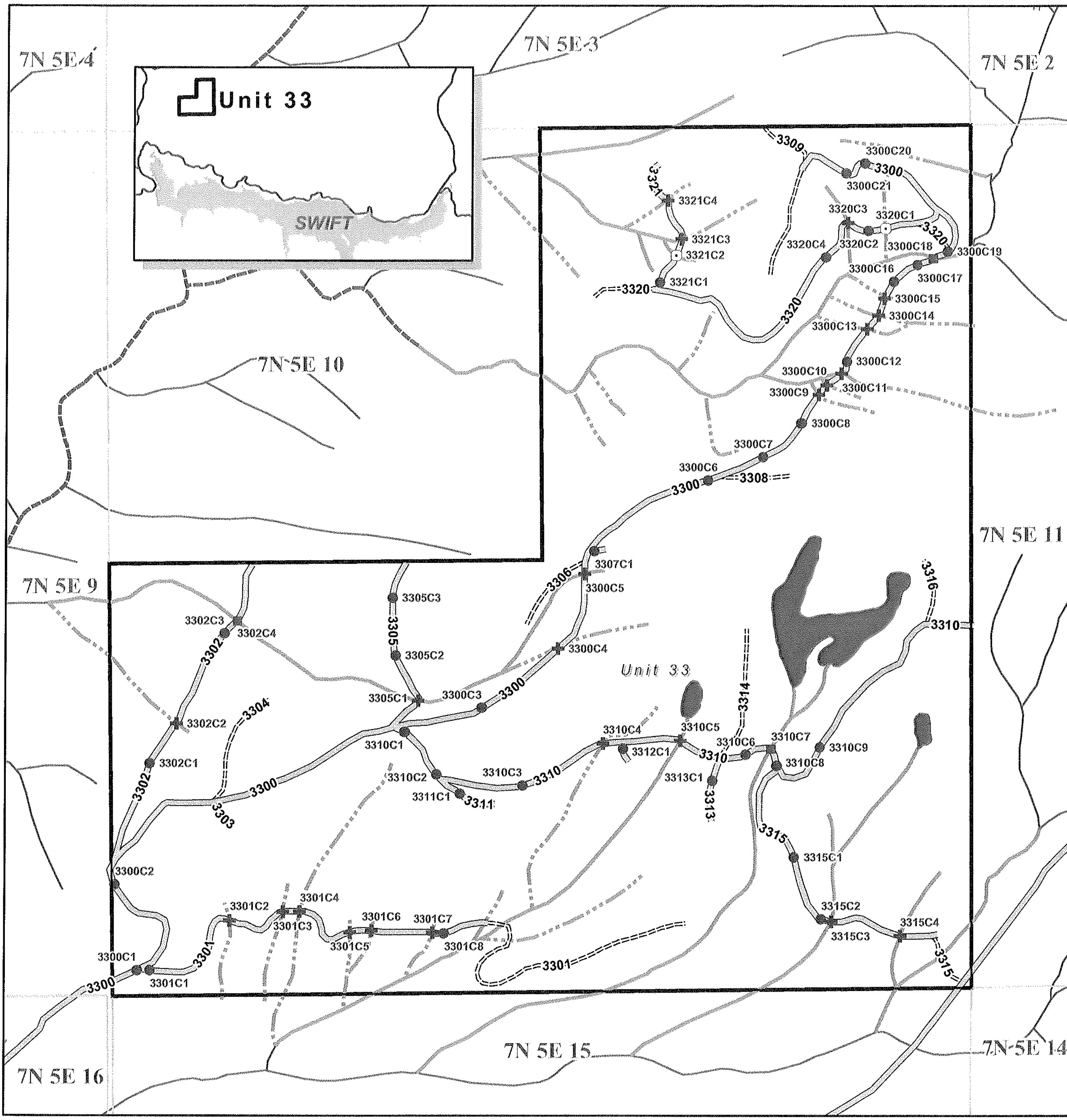
☐ **Land Sold.**

1. Who did you sell forest land to?	**2.** Sold property RMAP number(s)	**3.** Number of acres in forest land sale	**4.** Number of forest road miles in sale	**5.** Number of forest road miles not up to Forest Practices standards	**6.** Number of fish blockages remaining to be opened

Map standards:

1. Scale range from 1:12000 to 1:48000
2. Map label, legend, and date
3. Color or black and white
4. Section, Township, and Range information
5. Property boundaries subject to update
6. Maximum paper size of 11" X 17" (use multiple sheets if necessary)
7. RMAP number(s) if assigned by DNR

Landowner name ***PacifiCorp Energy***	***Printed name of landowner representative:*** ***Kirk Naylor***
Management company name if different from above:	***Signature of landowner representative and date signed:*** Kirk S Naylor for PacifiCorp
Mailing address ***825 NE Multnomah – Suite 1500***	***Contact phone number(s):*** ***503-813-6619***
City, State, and zip code ***Portland OR 97232***	***Contact email address (optional):*** ***Kirk.naylor@pacificorp.com***



PacifiCorp - Unit 33

RMAP No. R2900305

0 500 1,000

Feet

Legend

Transportation

- Road
- Abandoned Road
- Road Block
- Gate
- Ford
- Bridge
- Ditch Culvert
- Stream Culvert

Water Features

- Wetlands
- Water Body
- Fish Stream
- Non-fish Perennial
- Non-fish Seasonal
- Other
- PacifiCorp Ownership

PACIFICORP ENERGY
A DIVISION OF PACIFICORP

GIS Support Services
Solutions Group
gisdept@Pacificorp.com

Data are projected in UTM Zone 10, NAD83, meters.

FORM A
ASSESSMENT AND SCHEDULING WORKSHEET

PacifiCorp **Unit 33** Longview Timberlands Addition RMAP Number R2900305

12/28/2011

Road Name	Road Segment	Road Use	Surface	From	Length To	Culvert Number	Year Installed	Assessment and Work Description	Date of Planned Work	Year Work Completed
3300	1	1	2	0.0	1.7			Some protions of the ditch are non-functional Repair portions of the ditch	2012	
	1				0.1	3300C1		Ditch culvert, 18" Routine maintenance		
	1				0.2	3300C2		Ditch culvert, 18" Routine maintenance		
	1				0.7	3300C3		Ditch culvert, 18", plastic Routine maintenance		
	1				0.8	3300C4		Type Ns water, 36" culvert; Shotgun outlet Repair shotgun outlet	2012	
	1				0.9	3300C5		Type Np water, 24" culvert Routine maintenance		
	1				1.1	3300C6		Ditch culvert, 18" Routine maintenance		
	1				1.2	3300C7		Ditch culvert, 18" Routine maintenance		
	1				1.2	3300C8		Ditch culvert, 18" Routine maintenance		
	1				1.2	3300C9		Type Ns water, 18" culvert Routine maintenance		
	1				1.3	3300C10		Type Ns water, 24" culvert Routine maintenance		
	1				1.3	3300C11		Type Np water, 36" culvert; Shotgun outlet Repair shotgun outlet	2012	
	1				1.3	3300C12		Ditch culvert, 18" Routine maintenance		
	1				1.4	3300C13		Type Ns water, 36" culvert Routine maintenance		
	1				1.4	3300C14		Type Ns water, 24" culvert Routine maintenance		
	1				1.4	3300C15		Ditch culvert, 24" Routine maintenance		
	1				1.5	3300C16		Ditch culvert, 18" Routine maintenance		
	1				1.5	3300C17		Ditch culvert, 18" Routine maintenance		
	1				1.5	3300C18		Bridge		
	1				1.5	3300C19		Ditch culvert, 18" Routine maintenance		

Road Use: Forestry-1, Utility-2, Recreation-3, Abandoned-4, Orphaned-5
Surface: Paved-1, Gravel-2, Dirt-3

FORM A
ASSESSMENT AND SCHEDULING WORKSHEET

PacifiCorp **Unit 33**

RMAP Number R2900305

Road Name	Road Segment	Road Use	Surface	Length From	Length To	Culvert Number	Year Installed	Assessment and Work Description	Date of Planned Work	Year Work Completed
	1				1.6	3300C20		Ditch culvert, 32" Routine maintenance		
	1				1.6	3300C21		Ditch culvert, 24" Routine maintenance		
	2	4		0.0	0.1			ABANDONED		
3301	3	1	3	0.0	0.5			Some protions of the ditch are non-functional Repair portions of the ditch	2012	
	3				0.0	3301C1		Ditch culvert, 18" Routine maintenance		
	3				0.1	3301C2		Type Ns water, 24" culvert Routine maintenance		
	3				0.2	3301C3		Type Ns water, 24" culvert Routine maintenance		
	3				0.2	3301C4		Type Ns water, 40" culvert Routine maintenance		
	3				0.3	3301C5		Type Ns water, 24" culvert Routine maintenance		
	3				0.3	3301C6		Type Ns water, 18" culvert Routine maintenance		
	3				0.4	3301C7		Type Ns water, 24" culvert Routine maintenance		
	3				0.4	3301C8	2011	Ditch culvert, 12" Routine maintenance		
	4	4		0.0	0.4			ABANDONED		
3302	5	1	2	0.0	0.4			Some protions of the ditch are non-functional Repair portions of the ditch	2012	
	5				0.1	3302C1		Ditch culvert, 18" Routine maintenance		
	5				0.2	3302C2		Ditch culvert, 18" Routine maintenance		
	5				0.3	3302C3		Ditch culvert, 18" Routine maintenance		
	5				0.3	3303C4		Bridge		
3303	6	4		0.0	0.1			ABANDONED		
3304	7	4		0.0	0.2			ABANDONED		
3305	8	1	2	0.0	0.2			Some protions of the ditch are non-functional Repair portions of the ditch	2012	
	8				0.0	3305C1		Type Np water, 72" culvert Routine maintenance		

Road Use: Forestry-1, Utility-2, Recreation-3, Abandoned-4, Orphaned-5
Surface: Paved-1, Gravel-2, Dirt-3

PacifiCorp **Unit 33**

FORM A
ASSESSMENT AND SCHEDULING WORKSHEET

RMAP Number R2900305

Road Name	Road Segment	Road Use	Surface	Length From	Length To	Culvert Number	Year Installed	Assessment and Work Description	Date of Planned Work	Year Work Completed
	8				0.1	3305C2		Ditch culvert, 24" Routine maintenance		
	8				0.2	3305C3		Ditch culvert, 18" Routine maintenance		
3306	9	4		0.0	0.1			ABANDONED		
3307	10	1	3	0.0	0.1			Some protions of the ditch are non-functional Repair portions of the ditch	2012	
	10				0.0	3307C1		Ditch culvert, 18" Routine maintenance		
3308	11	4		0.0	0.1			ABANDONED		
3309	12	4		0.0	0.1			ABANDONED		
3310	13	1	2	0.0	0.8			Some protions of the ditch are non-functional Repair portions of the ditch	2012	
	13				0.0	3310C1		Ditch culvert, 18" Routine maintenance		
	13				0.1	3310C2		Ditch culvert, 18" Routine maintenance		
	13				0.2	3310C3		Ditch culvert, 18" Routine maintenance		
	13				0.3	3310C4		Type Ns water, 24" culvert; Stream in ditch Install stream culvert	2012	
	13				0.4	3310C5		Type Np water, 24" culvert Routine maintenance		
	13				0.5	3310C6		Ditch culvert, 18" Routine maintenance		
	13				0.5	3310C7		Bridge		
	13				0.5	3310C8		Ditch culvert, 18" Routine maintenance		
	13				0.6	3310C9		Ditch culvert, 24" Routine maintenance		
3311	14	1	2	0.0	0.1			Some protions of the ditch are non-functional Repair portions of the ditch		
	14				0.0	3311C1		Ditch culvert, 18" Routine maintenance		
3312	15	1	2	0.0	0.1			Some protions of the ditch are non-functional Repair portions of the ditch	2012	
	15				0.0	3312C1		Ditch culvert, 18" Routine maintenance		
3313	16	1	2	0.0	0.1			Some protions of the ditch are non-functional Repair portions of the ditch	2012	

Road Use: Forestry-1, Utility-2, Recreation-3, Abandoned-4, Orphaned-5
Surface: Paved-1, Gravel-2, Dirt-3

FORM A
ASSESSMENT AND SCHEDULING WORKSHEET

PacifiCorp **Unit 33**

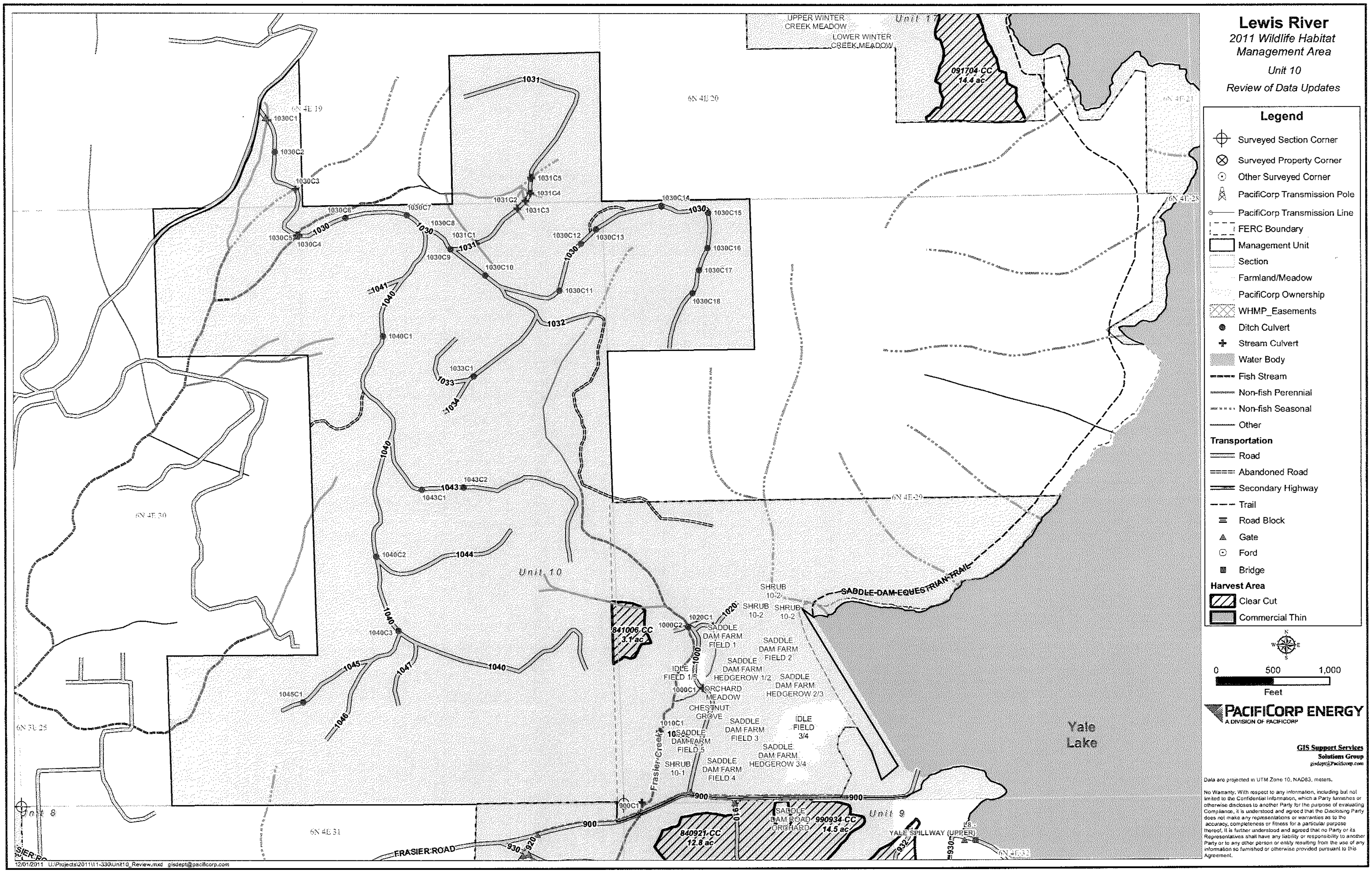
RMAP Number R2900305

Road Name	Road Segment	Road Use	Surface	From	Length To	Culvert Number	Year Installed	Assessment and Work Description	Date of Planned Work	Year Work Completed
					0.0	3313C1		Ditch culvert, 18" Routine maintenance		
3314	17	4		0.0	0.2			ABANDONED		
3315	18	1	2	0.0	0.3			Some protions of the ditch are non-functional Repair portions of the ditch	2012	
	18				0.1	3315C1		Ditch culvert, 18" Routine maintenance		
	18				0.2	3315C2		Ditch culvert, 18" Routine maintenance		
	18				0.2	3315C3		Type Np water, 72" culvert Routine maintenance		
	18				0.3	3315C4		Type Np water, 24" culvert Routine maintenance		
	19	4		0.0	0.1			ABANDONED		
3316	20	4		0.0	0.1			ABANDONED		
3320	21	1	3	0.0	0.4			Active slump in road Repair slump	2012	
	21				0.1	3320C1		Ford		
	21				0.1	3320C2		Ditch culvert, 24" Routine maintenance		
	21				0.1	3320C3		Type Np water, 36" culvert Routine maintenance		
	21				0.2	3320C4		Ditch culvert, 18" Routine maintenance		
	22	4		0.0	0.1			ABANDONED		2011
3321	23	1	3	0.0	0.2			Road segment meets current standards Routine maintenance		
	23				0.0	3321C1		Ditch culvert, 18" Routine maintenance		
	23				0.1	3321C2		Ford		
	23				0.1	3321C3		Type Np water, 36" culvert Routine maintenance		
	23				0.2	3321C4		Ditch culvert, 24" Routine maintenance		

Total Road Length 5.8 Miles

Road Use: Forestry-1, Utility-2, Recreation-3, Abandoned-4, Orphaned-5

Surface: Paved-1, Gravel-2, Dirt-3


Lewis River
2011 Wildlife Habitat Management Area
Unit 10
Review of Data Updates
Legend
Surveyed Section Corner
Surveyed Property Corner
Other Surveyed Corner
PacifiCorp Transmission Pole
PacifiCorp Transmission Line
FERC Boundary
Management Unit
Section
Farmland/Meadow
PacifiCorp Ownership
WHMP_Easements
Ditch Culvert
Stream Culvert
Water Body
Fish Stream
Non-fish Perennial
Non-fish Seasonal
Other
Transportation
Road
Abandoned Road
Secondary Highway
Trail
Road Block
Gate
Ford
Bridge
Harvest Area
Clear Cut
Commercial Thin
0 500 1,000
Feet
PACIFICORP ENERGY
A DIVISION OF PACIFICORP
GIS Support Services
Solutions Group
gisdept@Pacificorp.com
Data are projected in UTM Zone 10, NAD83, meters.
No Warranty: With respect to any information, including but not limited to the Confidential Information, which a Party furnishes or otherwise discloses to another Party for the purpose of evaluating Compliance, it is understood and agreed that the Disclosing Party does not make any representations or warranties as to the accuracy, completeness or fitness for a particular purpose thereof. It is further understood and agreed that no Party or its Representatives shall have any liability or responsibility to another Party or to any other person or entity resulting from the use of any information so furnished or otherwise provided pursuant to this Agreement.
UPPER WINTER CREEK MEADOW
LOWER WINTER CREEK MEADOW
Unit 17
091704 CC 14.4 ac
6N 4E 19
6N 4E 20
6N 4E 21
6N 4E 28
6N 4E 29
6N 4E 30
6N 3E 25
6N 4E 31
6N 4E 32
Unit 10
Unit 8
Unit 9
SADDLE-DAM-EQUESTRIAN-TRAIL
841006 CC 3.1 ac
840921 CC 12.8 ac
990934 CC 14.5 ac
SADDLE DAM FARM FIELD 1
SADDLE DAM FARM FIELD 2
SADDLE DAM FARM FIELD 3
SADDLE DAM FARM FIELD 4
SADDLE DAM FARM FIELD 5
SADDLE DAM FARM HEDGEROW 1/2
SADDLE DAM FARM HEDGEROW 2/3
SADDLE DAM FARM HEDGEROW 3/4
IDLE FIELD 1/5
IDLE FIELD 3/4
ORCHARD MEADOW
CHESTNUT GROVE
SHRUB 10-1
SHRUB 10-2
SADDLE DAM ROAD ORCHARD
YALE SPILLWAY (UPPER)
Yale Lake
Frasier Creek
FRASIER ROAD
900
1000
1030
1031
1032
1033
1034
1040
1041
1043
1044
1045
1046
1047
1020
930
920
12/01/2011 U:\Projects\2011\11-330\Unit10_Review.mxd gisdept@pacificorp.com

FORM A
ASSESSMENT AND SCHEDULING WORKSHEET

PacifiCorp **Unit 10** Longview Timberlands Addition RMAP Number R2900305
8/12/2011 Page 2

Road Name	Road Segment	Road Use	Surface	Length From	Length To	Culvert Number	Year Installed	Assessment and Work Description	Date of Planned Work	Year Work Completed
1031	6	1	2	0.0	0.5			Soft areas in road surface Rock soft areas	September 2011	2011
	6				0.0	1031C1		Type Ns water, 18"culvert Routine maintenance		
	6				0.1	1031C2		Type Ns water, 12"culvert Routine maintenance		
	6				0.1	1031C3	2011	Type Ns water, 18" culvert, plastic Routine maintenance	September 2011	2011
	6				0.1	1031C4		Type Ns water, 12" culvert Replace with 18"		
	6				0.2	1031C5		Type Ns water, 12"culvert Routine maintenance		
1032	7	1	2	0.0	0.1			Road segment meets current standards Routine maintenance		
	8	4		0.2	0.5			ABANDONED		
1033	9	1	2	0.0	0.3			Road segment meets current standards Routine maintenance		
	9				0.2	1033C1		Ditch culvert, 16" Routine maintenance		
1034	10	1	2	0.0	0.1			Road segment meets current standards Routine maintenance		
1040	11	1	2	0.0	1.1			Road segment meets current standards Routine maintenance		
	11				0.2	1040C1		Ditch culvert, 10" Routine maintenance		
	11				0.6	1040C2		Ditch culvert, 12" Routine maintenance		
	11				0.7	1040C3		Ditch culvert, 12" Routine maintenance		
1041	12			0.0	0.1			Road segment meets current standards Routine maintenance		
1042	13	4		0.0	0.1			ABANDONED		
1043	14	1	2	0.0	0.4			Soft areas in road surface Rock soft areas	September 2011	2011
	14				0.1	1043C1		Ditch culvert, 12" Routine maintenance		
	14				0.2	1043C2		Ditch culvert, 12" Routine maintenance		
1044	15			0.0	0.3			Road segment meets current standards Routine maintenance		
1045	16			0.0	0.3			Road segment meets current standards Routine maintenance		
	16				0.2	1045C1		Ditch culvert, 12" Routine maintenance		
1046	17			0.0	0.1			Road segment meets current standards Routine maintenance		
1047	18			0.0	0.1			Road segment meets current standards Routine maintenance		

Total Road Length 4.9 Miles

FORM A
ASSESSMENT AND SCHEDULING WORKSHEET

PacifiCorp **Unit 10** Longview Timberlands Addition RMAP Number R2900305
8/12/2011 Page 2

Road Name	Road Segment	Road Use	Surface	Length From	Length To	Culvert Number	Year Installed	Assessment and Work Description	Date of Planned Work	Year Work Completed
1031	6	1	2	0.0	0.5			Soft areas in road surface Rock soft areas	September 2011	2011
	6				0.0	1031C1		Type Ns water, 18"culvert Routine maintenance		
	6				0.1	1031C2		Type Ns water, 12"culvert Routine maintenance		
	6				0.1	1031C3	2011	Type Ns water, 18" culvert, plastic Routine maintenance	September 2011	2011
	6				0.1	1031C4		Type Ns water, 12" culvert Replace with 18"		
	6				0.2	1031C5		Type Ns water, 12"culvert Routine maintenance		
1032	7	1	2	0.0	0.1			Road segment meets current standards Routine maintenance		
	8	4		0.2	0.5			ABANDONED		
1033	9	1	2	0.0	0.3			Road segment meets current standards Routine maintenance		
	9				0.2	1033C1		Ditch culvert, 16" Routine maintenance		
1034	10	1	2	0.0	0.1			Road segment meets current standards Routine maintenance		
1040	11	1	2	0.0	1.1			Road segment meets current standards Routine maintenance		
	11				0.2	1040C1		Ditch culvert, 10" Routine maintenance		
	11				0.6	1040C2		Ditch culvert, 12" Routine maintenance		
	11				0.7	1040C3		Ditch culvert, 12" Routine maintenance		
1041	12			0.0	0.1			Road segment meets current standards Routine maintenance		
1042	13	4		0.0	0.1			ABANDONED		
1043	14	1	2	0.0	0.4			Soft areas in road surface Rock soft areas	September 2011	2011
	14				0.1	1043C1		Ditch culvert, 12" Routine maintenance		
	14				0.2	1043C2		Ditch culvert, 12" Routine maintenance		
1044	15			0.0	0.3			Road segment meets current standards Routine maintenance		
1045	16			0.0	0.3			Road segment meets current standards Routine maintenance		
	16				0.2	1045C1		Ditch culvert, 12" Routine maintenance		
1046	17			0.0	0.1			Road segment meets current standards Routine maintenance		
1047	18			0.0	0.1			Road segment meets current standards Routine maintenance		

Total Road Length 4.9 Miles