

Commissioners:  
T. JAMES DAVIS  
LYNN M. HEMINGER  
RONALD E. SKAGEN

General Manager:  
WILLIAM C. DOBBINS



# Public Utility District No. 1 of Douglas County

1161 Valley Mall Parkway • East Wenatchee, Washington 98802-4497 • 509/884-7191 • FAX 509/884-0553 • [www.douglaspud.org](http://www.douglaspud.org)

December 29, 2008

Honorable Kimberly D. Bose  
Secretary  
Federal Energy Regulatory Commission  
888 First Street, NE  
Washington DC 20426

**Subject: Wells Hydroelectric Project No. 2149  
2005-2008 Comprehensive Report - Wells Bull Trout Monitoring and  
Management Plan**

Dear Secretary:

In accordance with Article 62 of the Federal Energy Regulatory Commission (Commission) license for the Wells Hydroelectric Project, the Public Utility District No. 1 of Douglas County (Douglas PUD) hereby submits its final report detailing the implementation of activities covered by the Wells Bull Trout Monitoring and Management Plan (Bull Trout Plan), 2005-2008.

On June 21, 2004, the Commission issued orders amending the license for the Wells Project in order to implement the terms of the Anadromous Fish Agreement and Habitat Conservation Plan (Wells HCP). The United States Fish and Wildlife Service (USFWS) issued a biological opinion (BO) pursuant to Section 7 of the Endangered Species Act (ESA) to assess the effects of the HCP on ESA listed bull trout and other listed species under the jurisdiction of the USFWS. The BO included reasonable and prudent measures (RPMs) and associated terms and conditions for implementing the RPMs for bull trout. The Commission order approving the Wells HCP added Article 61, 62 and 63 to the Wells Project license.

Article 61 of the license required Douglas PUD to file with the Commission a Bull Trout Plan for monitoring take associated with the operations of the Wells Project. Article 61 further required that Douglas PUD prepare the Bull Trout Plan in consultation with the USFWS, National Marine Fisheries Service (NMFS), Washington Department of Fish and Wildlife (WDFW), and interested Indian Tribes (Colville Confederated Tribes and the Yakama Nation).

Following consultation with the USFWS, NMFS, WDFW, Colville Confederated Tribes, and the Yakama Nation, Douglas PUD filed the Bull Trout Plan with the Commission on February 28, 2005. The Bull Trout Plan was approved by the Commission on April 19, 2005.

Article 62 of the license requires Douglas PUD to prepare and file with the Commission an annual report describing the activities required by the Bull Trout Plan.

Article 63 of the license reserves the Commission's authority to require Douglas PUD to carry out specified measures for the purpose of participating in the development and implementation of a bull trout recovery plan.

Consistent with Article 62 of the license, Douglas PUD has prepared and filed with the Commission, each year, an annual report describing the activities required by the Bull Trout Plan. On March 26, 2008, Douglas PUD filed a request for an extension of time to file the 2007 Annual Bull Trout Plan in order to include the January through July 2008 monitoring results into the final take monitoring report for 2005 – 2008 which is due December 31, 2008. An order granting the extension of time to December 31, 2008, under Article 62, was issued April 16, 2008.

Enclosed, please find Douglas PUD's final comprehensive report for activities covered under the Bull Trout Plan during calendar years 2005-2008. This report was distributed as a draft to the USFWS for review and comment. The comments received from the USFWS have been addressed in the final report. The enclosed report includes the most recent annual report for calendar year 2007, along with monitoring results for most of 2008 and includes annual take calculations resulting from an analysis of bull trout data collected over the past 8 years (2001-2008) of monitoring at the Wells Hydroelectric Project.

The next reporting deadline associated with the Bull Trout Plan is March 31, 2009 (2008 Annual Report). However, because the report contained herein includes bull trout monitoring activities for most of 2008, Douglas PUD is requesting to eliminate the March 2009 filing of the 2008 Annual Report and instead include all remaining 2008 activities within the 2009 annual report that is scheduled to be filed with the FERC on March 31, 2010.

If you have any questions related to the 2005-2008 final bull trout monitoring report, please contact Shane Bickford, Supervisor of Relicensing at (509) 881-2208 or [sbickford@dcpud.org](mailto:sbickford@dcpud.org).

Sincerely,



Robert W. Clubb, Ph.D.  
Chief of Environmental and Regulatory Services

Copy: Mark Miller, USFWS  
Steve Lewis, USFWS  
Gregg Kurz, USFWS  
Jim Craig, USFWS  
Mike Schiewe, Coordinator - HCP Coordinating Committee  
HCP Coordinating Committee - Members List  
Shane Bickford, Douglas PUD  
Joshua Murauskas, Douglas PUD

**BULL TROUT MONITORING AND MANAGEMENT PLAN  
2005-2008 FINAL REPORT**

**WELLS HYDROELECTRIC PROJECT**

**FERC PROJECT NO. 2149**

December 2008

Prepared by:  
LGL Environmental Research Associates  
Ellensburg, Washington  
and  
Public Utility District No. 1 of Douglas County  
East Wenatchee, Washington

Prepared for:  
Public Utility District No. 1 of Douglas County  
East Wenatchee, Washington

For copies of this Study Report, contact:

Public Utility District No. 1 of Douglas County  
Attention: Relicensing  
1151 Valley Mall Parkway  
East Wenatchee, WA 98802-4497  
Phone: (509) 884-7191  
E-Mail: [relicensing@dcpud.org](mailto:relicensing@dcpud.org)

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**Table of Contents**

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<b>EXECUTIVE SUMMARY .....</b>	<b>1</b>
<b>1.0 INTRODUCTION.....</b>	<b>4</b>
<b>2.0 GOALS AND OBJECTIVES .....</b>	<b>5</b>
2.1 Objective 1 - Adult Bull Trout Passage Monitoring.....	6
2.2 Objective 2 - Sub-adult Bull Trout Passage Monitoring .....	7
2.3 Objective 3 - Bull Trout Entrapment and Stranding Evaluation.....	8
2.4 Objective 4 - Identification of Core Area and Local Populations of Bull Trout that Utilize the Wells Project Area.....	8
<b>3.0 STUDY AREA.....</b>	<b>8</b>
3.1 Wells Bull Trout Plan Study Area .....	8
3.2 General Description of the Wells Hydroelectric Project Area.....	9
<b>4.0 BACKGROUND AND EXISTING INFORMATION .....</b>	<b>11</b>
4.1 Bull Trout Biology .....	11
4.2 Status.....	12
4.3 2001-2004 Mid-Columbia Bull Trout Radio Telemetry Study .....	13
<b>5.0 METHODOLOGY .....</b>	<b>16</b>
5.1 Strategy 1-1: Adult bull trout telemetry program .....	16
5.1.1 Tagging .....	16
5.1.2 Telemetry monitoring .....	17
5.1.2.1 Data processing.....	18
5.2 Strategy 1-1: Calculation of Incidental Take for Adult Bull Trout .....	19
5.3 Strategy 1-2: Correlations between adult bull trout passage events and Project operations.....	19
5.4 Strategy 1-3: Off-season fishway passage of adult bull trout.....	20
5.5 Strategy 1-4: Develop plan to address adult bull trout passage problems if identified.....	20
5.6 Strategy 2-1: Sub-adult bull trout PIT tagging program.....	20
5.7 Strategy 2-2: Off-season fishway passage of sub-adult bull trout .....	20
5.8 Strategy 3-1: Evaluate bull trout stranding and entrapment .....	20
5.9 Strategy 4-1: Genetic sampling program .....	21
5.10 Strategy 4-2: Determine locations of Wells Dam bull trout outside the Project Area.....	21
<b>6.0 RESULTS .....</b>	<b>22</b>
6.1 Strategy 1-1: Adult bull trout telemetry program .....	22
6.1.1 Bull trout tagged by Douglas PUD .....	22
6.1.1.1 Results from Fish Tagged in 2007 .....	22
6.1.1.2 Results from Fish Tagged in 2006 .....	25
6.1.1.3 Results from Fish Tagged in 2005 .....	26
6.1.2 Bull trout tagged by Chelan PUD .....	26

6.1.3	Bull trout tagged by US Fish and Wildlife Service .....	26
6.1.4	Results from 2001 to 2004 bull trout telemetry project (BioAnalysts, Inc. 2004) .....	27
6.1.5	Wells Project 6-year-average Incidental take calculation (2000 to 2004 and 2005 to 2008 monitoring years combined) .....	27
6.2	Strategy 1-2: Correlations between passage events and Project operations .....	29
6.3	Strategy 1-3: Off-season fishway passage of adult bull trout .....	35
6.4	Strategy 1-4: Modifications to passage facilities or operations .....	37
6.5	Strategy 2-1: Sub-adult PIT tagging program .....	37
6.6	Strategy 2-2: Off-season fishway passage of sub-adult bull trout .....	37
6.7	Strategy 3-1: Inflow patterns, reservoir elevations, and backwater curves .....	37
6.8	Strategy 4-1: Genetic sampling program .....	38
6.9	Strategy 4-2: Destination locations of Wells Dam bull trout .....	38
<b>7.0</b>	<b>CONCLUSIONS .....</b>	<b>40</b>
<b>8.0</b>	<b>ACKNOWLEDGMENTS .....</b>	<b>40</b>
<b>9.0</b>	<b>REFERENCES.....</b>	<b>41</b>

## List of Tables

---

Table 6.1-1	Radio-tagged bull trout released by Douglas PUD, 2005-2007.-----	23
Table 6.1-2	Radio-tagged bull trout that passed downstream or upstream through Wells Dam, 2005-2008.-----	24
Table 6.1-3	Mobile tracking surveys conducted by Douglas PUD, 2006.-----	25
Table 6.1-4	Summary of downstream and upstream passage events of radio-tagged bull trout within one year of release through Wells Dam, 2001-2007. -----	28
Table 6.2-1	Project operations data for dates on which a bull trout passed downstream through Wells Dam, 2005-2008. -----	30
Table 6.2-2	Project operations data for dates on which a bull trout passed downstream through Wells Dam, 2005-2008. -----	31
Table 6.3-1	Fishway outage periods at Wells Dam, 2005-2007.-----	35
Table 6.5-1	Sub-adult bull trout PIT tagged in the Methow Basin, 2005-2008 (data from C. Snow, WDFW).-----	37
Table 6.9-1	Tributary use of radio-tagged bull trout detected at Wells Dam, 2005- 2008. -----	39

## List of Figures

---

Figure 3.2-1	Location map of the Wells Project. -----	10
Figure 4.3-1	Study area for assessing migration patterns of bull trout in the mid-Columbia River (2001-2004).-----	15
Figure 6.2-1	Mean daily values for turbine, spill, and combined discharge at Wells Dam during bull trout monitoring at Wells Dam. Circles indicate downstream passage events of bull trout. -----	32
Figure 6.2-2	Scatterplot matrix of Project operation variables and downstream passage events of radio-tagged bull trout at Wells Dam, 2005-2008. -----	33
Figure 6.2-3	Distribution of downstream passage events of bull trout passing through Wells Dam by month. -----	34
Figure 6.3-1	Daily count of bull trout passing upstream through Wells Dam, 2005-2008. Bull trout captured for tagging are included. -----	36



## **List of Appendices**

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**APPENDIX A DETECTION HISTORY SUMMARIES FOR EACH BULL TROUT  
DETECTED IN THE WELLS PROJECT AREA**

**APPENDIX B COMMENTS FROM U.S. FISH AND WILDLIFE SERVICE MID-  
COLUMBIA RELICENSING COORDINATOR**

## EXECUTIVE SUMMARY

The goal of the Wells Hydroelectric Project (Wells Project) Bull Trout Monitoring and Management Plan (Bull Trout Plan) is to identify, develop, and implement measures to monitor and address potential project-related impacts on bull trout (*Salvelinus confluentus*) associated with the operations of the Wells Project and associated facilities (Douglas PUD 2004). The Bull Trout Plan was prepared and implemented to meet monitoring requirements stipulated in a U.S. Fish and Wildlife Service (USFWS) Biological Opinion (USFWS 2004) regarding implementation of the Wells Project Anadromous Fish Agreement and Habitat Conservation Plan. The USFWS Biological Opinion monitoring requirements were also incorporated by the Federal Energy Regulatory Commission (FERC) into the existing Wells Project license in 2004. The Bull Trout Plan was developed in collaboration with the USFWS, National Marine Fisheries Service (NMFS), Washington Department of Fish and Wildlife (WDFW), the Colville Confederated Tribes, and the Yakama Nation, and was approved by the FERC. The Bull Trout Plan has four objectives, addressed by implementing various field study components from 2004 to 2008 at the Wells Project. This document is the final report summarizing the results of all study activities required by the Bull Trout Plan.

The first objective was to identify potential project-related impacts on upstream and downstream passage of adult bull trout (fish  $\geq 400$  mm in length) through Wells Dam and reservoir, and implement appropriate measures to monitor any incidental take of adult bull trout. To meet the first objective, radio telemetry was used to monitor upstream and downstream passage, and off-season video counting was done in the Wells Project fishways during the winter. Between 2005 and 2008, 26 adult bull trout were trapped at Wells Dam and radio-tagged. Concurrent with the implementation of the Bull Trout Plan, the USFWS and Public Utility District No. 1 of Chelan County (Chelan PUD) radio-tagged and released 136 adult bull trout at other mid-Columbia River basin locations including the Methow River, and Rock Island and Rocky Reach dams (50 USFWS tags 2006-2008, 86 Chelan PUD tags 2005-2007).

From 2005 to 2008, 25 downstream passage events and 52 upstream passage events by 40 individual bull trout were recorded at Wells Dam. Of these, 17 downstream and 41 upstream passage events occurred within one year of tagging and release. Of all tags released from 2001 to 2004, there were 2 downstream passage events and 41 upstream passage events. Of these, 2 downstream and 38 upstream passage events occurred within one year of release. The take estimates for the Wells Project were based upon the number of unique upstream and downstream passage events that took place within one year each bull trout being tagged and release. During the six year study and eight years of monitoring, 19 downstream and 79 upstream passage events took place at Wells Dam by radio-tagged bull trout within one year of release. Taking into account all observed passage events a total of 27 downstream and 93 upstream passage events took place at Wells Dam Radio-tagged bull trout passed downstream through the turbines or spillways as no downstream passage events were recorded via the fishways. Out of the 19 downstream passage events that occurred within one year of tagging, zero bull trout injury or mortality was observed at the Wells Project. Out of the 79 upstream passage events that occurred within one year of tagging, zero bull trout injury or mortality was observed at the Wells Project.

Upstream passage of adult bull trout through the fish ladders at Wells Dam has historically occurred between early May and late October, with peak passage typically occurring in May and June. During the 2005 and 2008 study, 214 adult bull trout were counted passing upstream through Wells Dam. The proportion of the bull trout population at Wells Dam that was radio-tagged was 24% ( $52/214 = 0.24$ ).

Project operations did not appear to influence the movements of adult bull trout. Instead, adult bull trout passage events appeared to be more closely associated with water temperature, photoperiod and time of year with rather predictable patterns of upstream and downstream movement. Because no take (injury or mortality) was observed during the study, there was no need to investigate how Project operations affected take at Wells Dam.

During the 2005-2008 monitoring period, no adult bull trout were counted during the 24-hour off-season fishway counting period (November 16 to April 30).

No upstream or downstream passage problems were identified during this study. Passage times upstream through the fishway appeared reasonable relative to the species migration and spawn timing. Because no passage problems were identified during the study, there was no need to develop recommendations to change or modify the fishway operations at Wells Dam.

The second objective was to assess project-related impacts on upstream and downstream passage of sub-adult bull trout (fish <400 mm in length). During the development of the Bull Trout Plan, stakeholders agreed that because of the inability to collect a sufficient sample size of sub-adult bull trout at Wells Dam, it was not feasible to assess sub-adult passage. However, when encountered at Wells Dam, or in tributary traps, sub-adult bull trout would be PIT tagged. Douglas PUD provided funding, equipment, training, and coordination for the sub-adult bull trout PIT tag program. From 2004 to 2008, 67 sub-adult bull trout were PIT tagged in the Methow River sub-basin during standard tributary smolt trapping operations. Douglas PUD operated PIT tag detection systems year-round within the Wells Dam fishways during the study period (2005 to 2008) and no PIT tagged sub-adult bull trout were detected. Additionally, sub-adult bull trout were to be PIT tagged opportunistically when encountered at the Wells Project; however, no sub-adult bull trout were encountered at Wells Dam during the study period.

Off-season (November 16 to April 30) video monitoring of the Wells Dam fishways for sub-adult bull trout was conducted during each of the years of this study including the winter of 2004 and 2005 as required by the Bull Trout Plan. Additional off-season counting took place during the winters of 2006 and 2007. To date, no sub-adult bull trout have been observed utilizing the fishways at Wells Dam.

The third objective was to investigate the potential for sub-adult entrapment or stranding in off-channel or backwater areas of Wells Reservoir. Field surveys were conducted at potential bull trout stranding sites during a period of low reservoir elevation. High resolution bathymetric information, reservoir elevations, backwater curves, and inflow patterns were used to identify potential stranding sites for the survey. No stranded or entrapped bull trout of any size were found during the field surveys conducted in 2006 and 2008. No surveys were conducted during 2005 or 2007 because river operations were not low enough to warrant a survey.

The fourth objective was to identify the core areas and local populations of bull trout that utilize the Wells Project. Data from radio-tagged bull trout tracked during the 2005 to 2008 study period were analyzed with data from the 2001 to 2004 study. Bull trout that pass Wells Dam (either upstream or downstream) migrated into the Methow, Entiat, and Wenatchee rivers during the spawning period. Observed tributary entrances of bull trout detected at Wells Dam from 2005 to 2008 were 86% Methow River, 10% Entiat River, and 2% Wenatchee River. Genetic samples of all fish tagged at Wells Dam were submitted to the USFWS for analysis. The USFWS is responsible for analyzing the genetic samples and providing those results. To further support this objective (Strategy 4-2: Work cooperatively with other agencies to obtain locations of radio-tagged fish outside the project area), Douglas PUD regularly coordinated bull trout data and monitoring activities with other agencies including the USFWS, and CCPUD).

In summary, no mortality or injury was observed for bull trout (adult and sub-adult) passing through or interacting with the operations of the Wells Project during the take monitoring studies conducted between 2001 and 2008. No incidental take of bull trout was observed at the Wells Project, and the Wells Project is presumed to be within the incidental take levels authorized by the USFWS Biological Opinion Incidental Take Statement (USFWS 2004).

## 1.0 INTRODUCTION

In August 1993, Douglas, Chelan, and Grant Public Utility Districts (collectively, “mid-Columbia PUDs”) initiated discussions to develop a long-term, comprehensive program for managing fish and wildlife that inhabit the mid-Columbia River basin (the portion of the Columbia River from the tailrace of Chief Joseph Dam to the confluence of the Yakima and Columbia rivers). These discussions first explored the possibility of developing an ecosystem-based plan for managing fish and wildlife resources inhabiting the mid-Columbia River basin. Due to the scope and scale of this conceptual plan, the negotiating parties decided to focus on an agreement for aquatic species inhabiting the mid-Columbia River basin including fish, plants, and animals. After extensive review, the negotiating parties determined that the best basin-wide approach would be to develop an agreement for anadromous salmonids, specifically: spring and summer/fall Chinook salmon (*Oncorhynchus tshawytscha*); sockeye salmon (*O. nerka*); coho salmon (*O. kisutch*); and steelhead (*O. mykiss*) (collectively, “Plan Species”) which are under the jurisdiction of National Marine Fisheries Service (NMFS).

On July 30, 1998, Public Utility District No. 1 of Douglas County (Douglas PUD), which operates the Wells Hydroelectric Project (Wells Project), submitted an unexecuted form of an Application for Approval of the Wells Anadromous Fish Agreement and Habitat Conservation Plan (the “HCP Agreement”) to Federal Energy Regulatory Commission (FERC) and NMFS. To expedite the ability of FERC to complete formal consultation, Douglas PUD prepared a biological evaluation of the effects of implementing the Habitat Conservation Plan (HCP) on listed species under the jurisdiction of the U.S. Fish and Wildlife Service (USFWS).

In a letter to FERC, the USFWS requested consultation under Section 7 of the ESA regarding the effects of hydroelectric project operations on bull trout (*Salvelinus confluentus*) in the Columbia River (letter from M. Miller, USFWS, to M. Robinson, FERC, dated January 10, 2000). The request for consultation was based on observations of bull trout in the study area. In its reply to the USFWS, FERC noted that there was virtually no information on bull trout in the mainstem Columbia River. To begin to address this information gap, an initial radio telemetry study of bull trout in the mid-Columbia basin was requested by USFWS in 2000 and implemented from 2001 to 2004 by Douglas, Chelan, and Grant PUDs (BioAnalysts, Inc. 2004).

On November 24, 2003, Douglas PUD filed an application with FERC for approval of the executed Wells HCP. The 2003 application for approval replaced the 1998 application with the executed form of the Wells HCP. On December 10, 2003, the USFWS received a request from FERC for formal Section 7 ESA consultation to determine whether the proposed incorporation of the HCP Agreement into the FERC license for operation of the Wells Project was likely to jeopardize the continued existence of the Columbia River distinct population segment (DPS) of ESA-listed bull trout, or destroy or adversely modify proposed bull trout critical habitat. In response to the FERC request, the USFWS issued a Biological Opinion (BO) pursuant to Section 7 of the ESA to assess the effects of the HCP on ESA listed bull trout and other listed species under the jurisdiction of the USFWS. The BO included an Incidental Take Statement outlining reasonable and prudent measures (RPMs) and associated terms and conditions to monitor and limit bull trout take at the Wells Project. On June 21, 2004, FERC issued orders amending the license for the Wells Project to implement the terms of the Wells HCP. FERC incorporated the

USFWS bull trout RPMs and terms and conditions into the existing Wells Project license, which are represented as license articles 61, 62, and 63.

Article 61 of the license required Douglas PUD to file with FERC a Bull Trout Plan for implementing the USFWS bull trout RPMs and terms and conditions, which were designed to monitor and limit bull trout take associated with Wells Project operations. Article 61 further required that Douglas PUD prepare the Bull Trout Plan in consultation with the USFWS, National Marine Fisheries Service (NMFS), WDFW, and interested Indian Tribes (Colville Confederated Tribes and the Yakama Nation). Following consultation with these stakeholders, on February 28, 2005, Douglas PUD filed with FERC the "*Wells Hydroelectric Project Bull Trout Monitoring and Management Plan, 2004-2008*" (Douglas PUD 2004), which is referred to as the "Bull Trout Plan" in this document. The Bull Trout Plan was approved by FERC on April 19, 2005.

Article 62 of the license requires Douglas PUD to prepare and file with FERC an annual report describing the activities required by the Bull Trout Plan. On March 26, 2008, Douglas PUD with approval from USFWS filed a request for an extension of time to submit the 2007 annual bull trout monitoring report and to consolidate the 2007 annual report with the final bull trout monitoring report, required to be filed with FERC by December 31, 2008. On April 16, 2008, FERC issued an order granting this request. This document summarizes all data collected to meet the Bull Trout Plan objectives over the required monitoring period from 2005 to 2008 and represents the final monitoring report. This final monitoring report completes all monitoring objectives outlined in the USFWS bull trout RPMs and terms and conditions, and the Wells Project license articles 61 and 62.

Article 63 was a reservation of authority by FERC to require the licensee to carry out specified measures for the purpose of participating in the development and implementation of a bull trout recovery plan. The USFWS has only recently reactivated the bull trout recovery planning process following a multi-year hiatus. In response to compliance with article 63 of the Wells Project license, Douglas PUD has and will continue to participate in the development of future recovery planning documents for bull trout.

## **2.0 GOALS AND OBJECTIVES**

The goal of the Bull Trout Plan is to identify, develop, and implement measures to monitor and address potential project-related impacts on bull trout from Wells Project operations and facilities. The Bull Trout Plan was intended to be an adaptive approach, where strategies for meeting the goals and objectives may be negotiated under a collaborative effort with stakeholders based on new information and ongoing monitoring results. The plan was designed specifically to: (1) address ongoing project-related impacts through the life of the existing operating license; (2) provide consistency with recovery actions as outlined in the USFWS Draft Bull Trout Recovery Plan; and (3) monitor and minimize the extent of any incidental take of bull trout consistent with Section 7 of the ESA.

The Bull Trout Plan has four main objectives including: (1) identify potential project-related impacts on upstream and downstream passage of adult bull trout through the Wells Dam and reservoir and implement appropriate measures to monitor any incidental take of bull trout; (2) assess project-related impacts on upstream and downstream passage of sub-adult bull trout; (3) investigate the potential for bull trout entrapment or stranding in off-channel or backwater areas of Wells Reservoir; and (4) identify the core areas and local populations, as defined in the USFWS Draft Bull Trout Recovery Plan, of the bull trout that utilize the Wells Project Area. The overall strategy framework to implement each objective is summarized below from the Bull Trout Plan<sup>1</sup>. A more detailed activity description is given in the methods section of this report.

## **2.1 Objective 1 - Adult Bull Trout Passage Monitoring**

Strategy 1-1: Implement an adult bull trout telemetry program to monitor adult upstream and downstream passage in the Wells Project Area and implement appropriate measures to monitor any incidental take of bull trout.

- Radio-tag 10 bull trout per year for three years from May 2005 to July 2007. Release tagged fish upstream of Wells Dam. Each fish will be counted as one successful adult fishway passage event for the year it is tagged.
- Install and maintain receiver arrays necessary to adequately monitor upstream and downstream passage through Wells Dam from 2005 to 2008.
- Track and monitor monthly movement of tagged fish from May 2005 to July 2008 until a tributary entrance is observed. Continue tracking all fish that re-enter the reservoir. Fixed receiver sites will be operated to detect any upstream and downstream movement at the dam and tributary entrances.
- Evaluate upstream and downstream tag detection data of each individual and conduct tag recovery operations in the Wells Project Area when warranted.
- Use data from the 2001 to 2004 study and from the 2005 to 2008 study to calculate a Wells Project 6-year-average take of bull trout by passage route where feasible, and statistically compare the level of take anticipated by the USFWS BO Incidental Take Statement (USFWS 2004) using a one-tailed test of the hypothesis that the anticipated incidental take level is not exceeded.
- If project effects are shown to be negligible as measured by incidental take monitoring, then the monitoring program will be repeated on a ten year interval to re-evaluate bull trout take.
- Douglas PUD will engage in cost share funding with the USFWS for analysis of genetic samples from fluvial bull trout sampled during the 2005 radio telemetry study.

Strategy 1-2: Analyze passage results and operational data to determine if correlations exist between passage times and passage events and project operations.

- Compile and characterize Project (spill, turbines, reservoir elevations, TDG) and ladder operations data during times of downstream passage for active tagged fish.

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<sup>1</sup> Please see the Bull Trout Plan for detailed strategy language.

Strategy 1-3: Determine off-season adult bull trout passage through the adult fishway (numbers and times of year) at Wells for an experimental period 2004-2005.

- Implement off-season fishway video counts at Wells Dam during the winter of 2004 through 2005, to record dates and times of adult bull trout passage.
- Evaluate results to determine if passage trends exist and when ladder maintenance should occur during the off-season during low bull trout usage periods (where reasonable and feasible).

Strategy 1-4: Should upstream or downstream passage problems be identified, pursue the feasibility of options to modify upstream passage facilities or operations that reduce the impact to bull trout passage.

- Douglas PUD will work with stakeholders to develop a collaborative plan to address adult passage problems, if warranted.

## **2.2 Objective 2 - Sub-adult Bull Trout Passage Monitoring**

Strategy 2-1: The stakeholders agree at this time<sup>2</sup> that because of the inability to collect a sufficient sample size of sub-adult bull trout, it is not feasible to assess sub-adult passage at Wells. However, when encountered at the Wells Project, or in tributary traps, sub-adult bull trout will be PIT tagged.

- Douglas PUD will provide PIT tags, equipment, standardized methods, training and coordination to enable tagging of sub-adult bull trout when these fish are incidentally encountered during operations at the Wells fishway, Methow brood-stock trap, and juvenile fish trapping in the Methow, Twisp, and Chewuch rivers.
- Douglas PUD will participate in efforts to explore new methods to monitor sub-adult bull trout movements in the Columbia River and evaluate, in conjunction with the USFWS, and implement new appropriate methods at the Wells Project.
- Douglas PUD will collect information from all PIT-tagged bull trout as they pass through the fishways at Wells Dam, screw traps and brood-stock collection facilities, and post PIT tag information to the PTAGIS website.

Strategy 2-2: Determine off-season sub-adult bull trout passage through the adult fishway (numbers and times of year) at Wells for an experimental period from 2004 to 2005.

- Implement off-season fishway video counts at Wells Dam during the entire winter of 2004 and 2005 to record dates and times of sub-adult bull trout passage.
- Evaluate results to determine if passage trends exist and when ladder maintenance should occur during the off-season during low bull trout usage periods (where reasonable and feasible).

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<sup>2</sup> At the time that the Bull Trout Plan was prepared in 2004.



## **2.3 Objective 3 - Bull Trout Entrapment and Stranding Evaluation**

Strategy 3-1: Evaluate Wells inflow patterns, reservoir elevations, and backwater curves to determine if stranding or entrapment of bull trout may occur.

- Review Wells forebay elevations, backwater curves, and historical discharges (daily, hourly) from Chief Joseph to determine Wells Reservoir surface water elevations during low flow periods.
- Determine if backwater locations exist that could pose stranding or entrapment hazards to bull trout during low flow hours, assess operational scenarios that could result in these hazards, and implement an appropriate study to determine bull trout use of such locations during low flow hours.
- Douglas PUD will work with stakeholders to address take resulting from entrapment or stranding (if identified).

## **2.4 Objective 4 - Identification of Core Area and Local Populations of Bull Trout that Utilize the Wells Project Area**

Strategy 4-1: Gather genetic samples from radio-tagged and PIT-tagged bull trout for comparison to baseline genetic samples from local populations and core areas.

- Douglas PUD will provide genetic sampling equipment, standardized methods, training, and coordination to enable collection of bull trout genetic samples during the radio telemetry study, and when fish are incidentally encountered during operations at the Wells fishway, and fish trapping in the Methow, Twisp, and Chewuch rivers.
- Douglas PUD will provide funding for the analysis of the genetic samples.

Strategy 4-2: Work cooperatively with other agencies to obtain locations of radio-tagged fish outside the Project area.

- Douglas PUD will participate in information exchanges and regional efforts to coordinate radio-tag frequencies for bull trout monitoring.
- If radio-tag frequencies deployed by Douglas PUD are not compatible with other monitoring efforts, the PUD will (when feasible) allow the use of their portable telemetry equipment for periodic aerial telemetry efforts.

## **3.0 STUDY AREA**

### **3.1 Wells Bull Trout Plan Study Area**

The study area for this report included all waters within the Wells Project, including the lower Okanogan and Methow rivers, the Wells Reservoir, Wells Dam, and Wells Tailrace, downstream to the “Gateway” location set at approximately 3 miles downstream from Wells Dam.

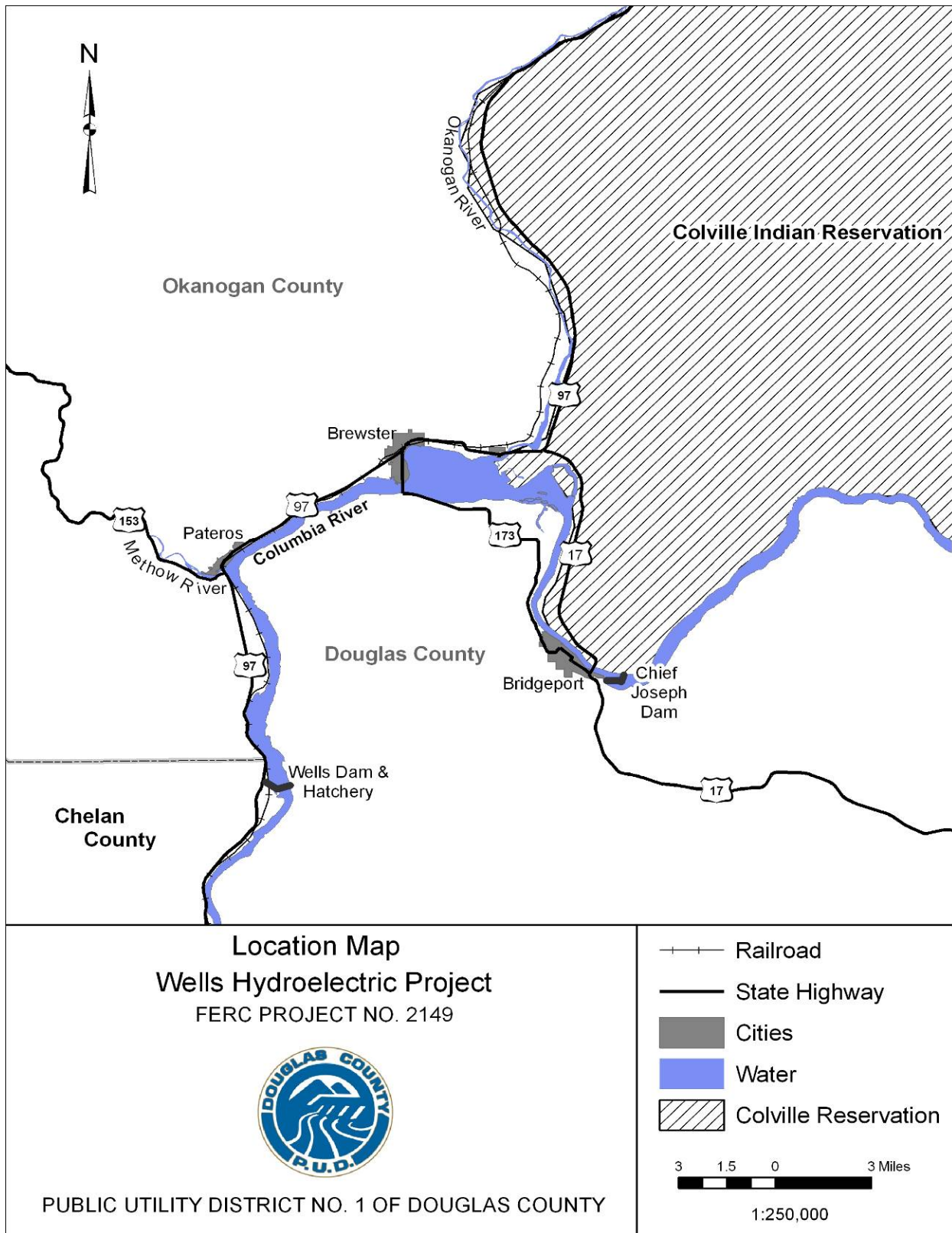
Additional monitoring also took place at downstream hydroelectric projects and other accessible reaches of the mid-Columbia Basin including the Methow, Wenatchee, Entiat, Wenatchee and Okanogan rivers. PIT tagging activities also occurred in the Methow and Twisp rivers.

### **3.2 General Description of the Wells Hydroelectric Project Area**

The Wells Project is located at river mile (RM) 515.6 on the Columbia River in the State of Washington. Wells Dam is located approximately 30 river miles downstream from the Chief Joseph Hydroelectric Project, owned and operated by the United States Army Corps of Engineers (COE), and 42 miles upstream from the Rocky Reach Hydroelectric Project owned and operated by Public Utility District No. 1 of Chelan County (Chelan PUD). The nearest town is Pateros, Washington, which is located approximately 8 miles upstream from the Wells Dam.

The Wells Project is the chief generating resource for Douglas PUD. It includes 10 generating units with a nameplate rating of 774,300 kW and a peaking capacity of approximately 840,000 kW. The design of the Wells Project is unique in that the generating units, spillways, switchyard, and fish passage facilities were combined into a single structure referred to as the hydrocombine. Fish passage facilities reside on both sides of the hydrocombine, which is 1,130 feet long, 168 feet wide, with a crest elevation of 795 feet mean sea level (msl) in height.

The Wells Reservoir is approximately 30 miles long. The Methow and Okanogan rivers are tributaries of the Columbia River within the Wells Reservoir. The Wells Project boundary extends approximately 1.5 miles up the Methow River and approximately 15.5 miles up the Okanogan River. The normal maximum surface area of the reservoir is 9,740 acres with a gross storage capacity of 331,200 acre-feet and usable storage of 97,985 acre-feet at elevation of 781 feet msl. The normal maximum water surface elevation of the reservoir is 781 feet msl (Figure 3.2-1).



**Figure 3.2-1 Location map of the Wells Project.**

## 4.0 BACKGROUND AND EXISTING INFORMATION

### 4.1 Bull Trout Biology

Bull trout are native to northwestern North America, historically occupying a large geographic range extending from California north into the Yukon and Northwest Territories of Canada, and East to Western Montana and Alberta (Cavender 1978). They are generally found in interior drainages, but also occur on the Pacific Coast in Puget Sound and in the large drainages of British Columbia.

Bull trout currently occur in lakes, rivers and tributaries in Washington, Montana, Idaho, Oregon (including the Klamath River basin), Nevada, two Canadian Provinces (British Columbia and Alberta), and several cross-boundary drainages in extreme southeast Alaska. East of the Continental Divide, bull trout are found in the headwaters of the Saskatchewan River in Alberta, and the Mackenzie River system in Alberta and British Columbia (Cavender 1978; McPhail and Baxter 1996; Brewin and Brewin 1997). The remaining distribution of bull trout is highly fragmented.

Bull trout are a member of the char group within the family Salmonidae. Bull trout closely resemble Dolly Varden (*Salvelinus malma*), a related species. Genetic analyses indicate, however, that bull trout are more closely related to an Asian char (*Salvelinus leucomaenis*) than to Dolly Varden (Pleyte et al. 1992). Bull trout are sympatric with Dolly Varden over part of their range, most notably in British Columbia and a small portion of the Coastal-Puget Sound region of Washington State.

Bull trout are believed to have more specific habitat requirements than other salmonids (Rieman and McIntyre 1993). Growth, survival, and long-term persistence are dependent upon habitat characteristics such as clean, cold, connected, and complex instream habitat (USFWS et al. 2000), and stream/population connectivity. Stream temperature and substrate type, in particular, are critical factors for the sustained long-term persistence of bull trout. Spawning is often associated with the coldest, cleanest, and most complex stream reaches within basins. However, bull trout may exhibit a patchy distribution, even in pristine habitats (Rieman and McIntyre 1995), and should not be expected to occupy all available habitats at the same time (Rieman et al. 1997).

Bull trout exhibit four distinct life history types: resident, fluvial, adfluvial, and anadromous. The fluvial, adfluvial, and resident forms exist throughout the range of the bull trout (Rieman and McIntyre 1993), although each form is not present everywhere. The anadromous life history form is currently known only to occur in the Coastal-Puget Sound region within the coterminous United States (Volk 2000; Kraemer 1994; Mongillo 1993). Multiple life history types may be expressed in the same population, and this diversity of life history types is considered important to the stability and viability of bull trout populations (Rieman and McIntyre 1993).

The majority of growth and maturation for anadromous bull trout occurs in estuarine and marine waters, adfluvial bull trout in lakes or reservoirs, and fluvial bull trout in large river systems.

Resident bull trout populations are generally found in small headwater streams where fish remain their entire lives.

For migratory life history types, juveniles tend to rear in tributary streams for 1 to 4 years before migrating downstream into a larger river, lake, or estuary and/or nearshore marine area to mature (Rieman and McIntyre 1993). In some lake systems, age 0+ fish (less than 1 year old) may migrate directly to lakes, but it is unknown if this emigration is a result of density dependent effects from limited stream rearing habitat, or if these young-of-the-year actually survive in the lake environment (Riehle et al. 1997). Juvenile bull trout in streams frequently inhabit side channels, stream margins and pools with suitable cover (Sexauer and James 1993) with maximum summer water temperatures generally less than 16°C (Dunham et al. 2003) and areas with cold hyporheic zones or groundwater upwellings (Baxter and Hauer 2000).

## 4.2 Status

On June 10, 1998, the USFWS listed bull trout within the Columbia River basin as threatened under the ESA (FR 63(111)). Later (November 1, 1999), the USFWS listed bull trout within the coterminous United States as threatened under the ESA (FR 64(210)). The USFWS identified habitat degradation, fragmentation, and alterations associated with dewatering, road construction and maintenance, mining, and grazing; blockage of migratory corridors by dams or other diversion structures; poor water quality; incidental angler harvest; entrainment into diversion channels; and introduced non-native species as major factors affecting the distribution and abundance of bull trout. They noted that dams (and natural barriers) have isolated population segments resulting in a loss of genetic exchange among these segments (FR 63(111)). The USFWS believes many populations are now isolated and disjunct. In October 2002, the USFWS completed the first draft of a bull trout recovery plan intended to provide information and guidance that will lead to recovery of the species, including its habitat (USFWS 2002). Threatened bull trout population segments are widely distributed over a large area and because population segments were subject to listing at different times, the USFWS adopted a two-tiered approach to develop the draft recovery plan for bull trout (USFWS 2002). In November 2002, the USFWS published in the federal register a proposed rule for the designation of critical habitat for the Klamath River and Columbia River distinct population segments of bull trout (67 FR 71235). In October 2004, the USFWS published a final rule in the Federal Register designating critical habitat for the Klamath River and Columbia River populations of bull trout (69 FR 59995).

In April 2008, the USFWS completed the 5-year status review for Columbia River bull trout with two recommendations: maintain “threatened” status for the species, and determine if multiple distinct population segments exist within the Columbia River that merit protection under the ESA. The recommendations intend to facilitate analysis of project effects over more specific and biologically appropriate areas, ultimately allowing a greater focus of regulatory protection and recovery resources (USFWS 2008a). The review also identified specific issues that limit the overall ability to accurately and quantitatively evaluate the current status of bull trout. Seven recommendations were made to improve future evaluation and management decisions, all of which are largely based on improvement and standardization of monitoring and evaluation

techniques, better delineation and agreement of core areas and Recovery Units, and multi-agency cooperation and management (USFWS 2008b).

The Wells Project is situated within the Upper Columbia River Recovery Unit<sup>3</sup> and the USFWS has identified the Wenatchee, Entiat, and Methow rivers as its core areas. A core area represents the closest approximation of a biologically functioning unit for bull trout. A core area may function as a metapopulation for bull trout. Not all core areas are equal and each has specific functions that are unique. For example, the Entiat Core Area depends heavily on the mainstem Columbia River to provide overwintering, migration, and foraging habitats. The Wenatchee Core Area has populations using lake and riverine habitat (both the Wenatchee and Columbia rivers) for overwintering, migration, and foraging. Within a core area, many local populations may exist. A local population is assumed to be the smallest group of fish that is known to represent a regularly interacting reproductive unit. Nineteen local populations have been identified in the Wenatchee (7), Entiat (2), and Methow (10) core areas (USFWS 2002).

### **4.3 2001-2004 Mid-Columbia Bull Trout Radio Telemetry Study**

Listed Columbia River bull trout have been counted at Wells Dam since 1998. In 2000, due to the potential for operations at mid-Columbia dams to affect the movement and survival of bull trout, the USFWS requested that the three mid-Columbia PUDs evaluate the movement and status of bull trout in their respective project areas. At that time, little was known about the life-history characteristics (e.g., movements, distribution, habitat use, etc.) of bull trout in the mid-Columbia River. Therefore, in order to assess the operational effects of hydroelectric projects on bull trout within the mid-Columbia, a three PUD coordinated radio telemetry study was implemented beginning in 2001. The goal of the study was to monitor the movements and migration patterns of adult bull trout in the mid-Columbia River using radio telemetry (Figure 4.3-1). The number of bull trout to be collected and tagged at each dam (Rock Island, Rocky Reach, and Wells) was based on the proportion of fish that migrated past those dams in 2000.

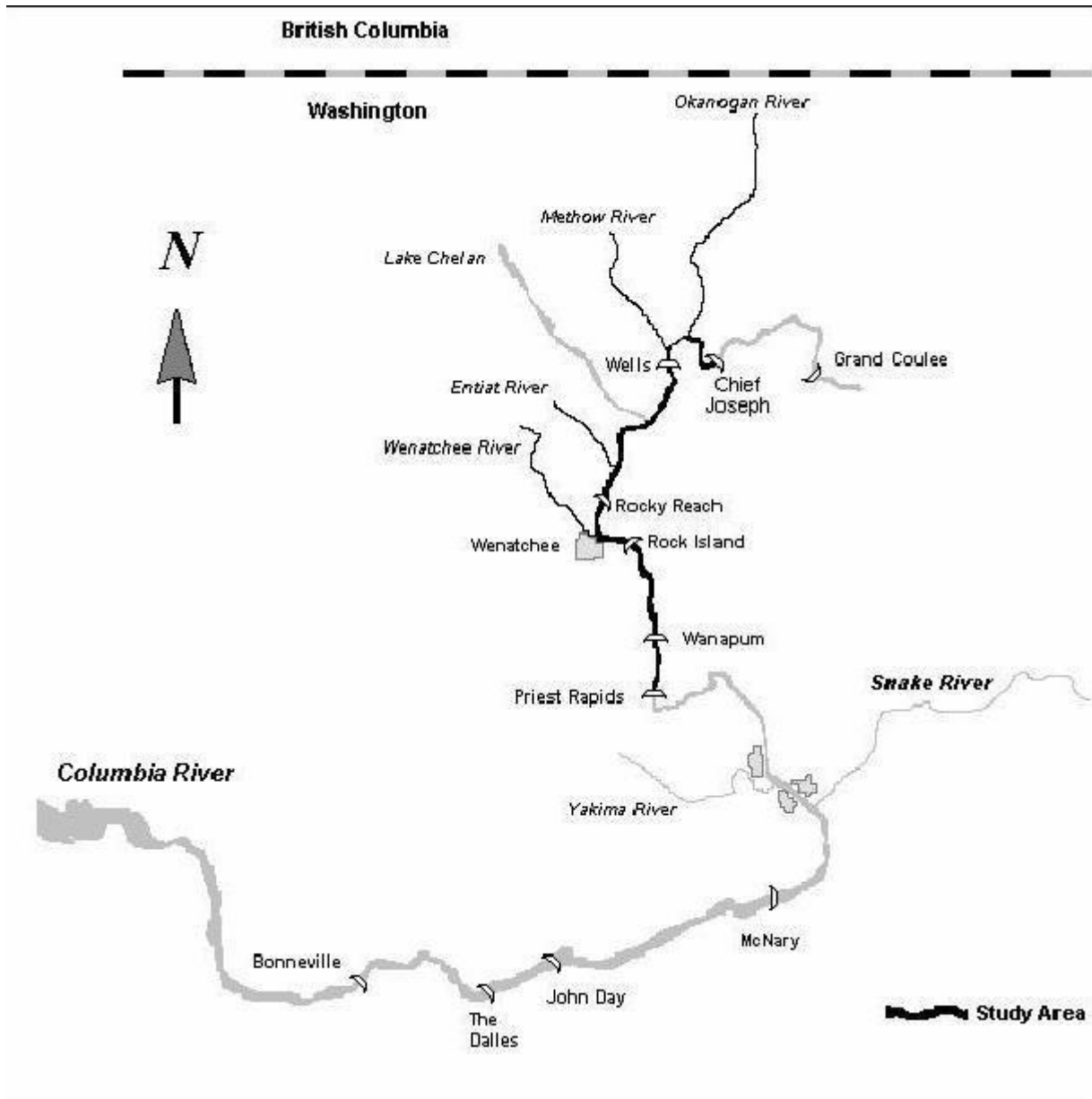
From 2001 to 2003, bull trout were collected from the Wells, Rocky Reach, and Rock Island dams, radio-tagged, and monitored through 2004. Multiple-telemetry techniques were used to assess the movement of tagged bull trout within the study area. At Wells Dam, a combination of aerial and underwater antennas was deployed. The primary purpose for this system was to document the presence of bull trout at the project, identify passage times and determine their direction of travel (i.e., upstream/downstream). In addition to these systems, a number of additional telemetry systems were deployed to address specific questions posed by the USFWS and Douglas PUD. At Wells Dam, several additional systems were installed to identify whether tagged bull trout could enter, ascend, and exit specific gates and fish ladders. All possible access points to the adult fish ladders and the exits were monitored individually during the study period from 2001-2004, allowing the route of passage to be determined as well as the ability to establish the exact time of entrance and exit from the ladder system.

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<sup>3</sup> Note that while the USFWS refers to the area encompassing the Wells Project as the Upper Columbia Recovery Unit for bull trout, the section of the Columbia River from Chief Joseph Dam to the confluence of the Yakima and Columbia rivers is generally termed the "mid-Columbia" for other watershed and salmon and steelhead recovery planning, and is the term used in this document when referring to the reach.

To assess bull trout movements into and out of the Wells Reservoir, fixed-telemetry monitoring sites were established at the mouth of the Methow and Okanogan rivers and periodic aerial surveys were conducted on the reservoir and throughout both watersheds (English et al. 1998, 2001). English et al. (1998, 2001) provide a detailed description of the telemetry systems at each of the dams and within the tributaries.

Overall, successful bull trout upstream and downstream passage was observed at the Wells Project. No bull trout injury or mortality was observed associated with the Wells Project. Radio-tagged bull trout that migrated upstream past Wells Dam utilized the Methow River subbasin during the bull trout spawning period. Key findings of the 2001 to 2004 study are used in this document to assess the 6-year average take analysis as stipulated in the Bull Trout Plan (Objective 1, Strategy 1-1) and are summarized in the results section of this document.



**Figure 4.3-1 Study area for assessing migration patterns of bull trout in the mid-Columbia River (2001-2004).**



## **5.0 METHODOLOGY**

A detailed description of the methodology to implement each Bull Trout Plan objective-strategy is presented below by individual strategy point.

### **5.1 Strategy 1-1: Adult bull trout telemetry program**

The adult bull trout telemetry program allowed monitoring of bull trout movements in the Wells Project, including the timing and frequency of upstream and downstream passage events, passage routes, and associated survival rates and quantification of take. The telemetry program also supported several of the other objectives of the Bull Trout Plan. For example, the telemetry program provided genetic samples of the radio-tagged adult bull trout in support of Strategy 4-1, and provided data on the timing and frequency of movements into and out of tributaries in support of Strategy 4-2. The telemetry program goal was to capture and radio-tag 10 adult bull trout each year for three years at Wells Dam (May 2005 through July 2007), with associated tracking through July 2008 as required by the Bull Trout Plan. Specific methods are presented below.

#### **5.1.1 Tagging**

In 2005, bull trout at Wells Dam were surgically implanted with Model Pisces coded radio tags manufactured by Grant Systems Engineering. Based on recommended tag weight to fish weight ratios, and bull trout length to weight relationships, only bull trout greater than 400 mm in length were selected for tagging. Also for the purposes of this study, "adult" bull trout were defined as fish  $\geq 400$  mm in length. In 2006 and 2007, Model MCFT-3A motion-sensor (i.e., mortality sensor) radio tags manufactured by Lotek were used. The motion-sensor tags changed their broadcast code if the tag remained motionless for 24 hours. For this study, the "motionless" signal was assumed to indicate fish mortality or expulsion of the tag. Tags were programmed to have mid-range motion sensitivity, which was shown during Lotek field tests (Lotek, unpublished data) to be most suitable to detect fish mortality.

Bull trout at Wells Dam were trapped using the brood-stock collection facilities located within the East and West fishways. Trapping operations occurred during the peak of the bull trout passage period as determined by the 2001-2004 study. The majority of the trapping occurred in the East fishway, though the west fishway trap was used periodically in all three tagging years.

The brood-stock collection facilities were located at pool 40 approximately half way up each fish ladder. The traps were operated by placing a barrier fence across the entire width of the pool. When a trap was in operation, all fish attempting to ascend the ladder were forced to ascend a steep-pass denil ladder into an upwell enclosure, and then down a sorting chute. When a bull trout was observed in the sorting chute, a technician redirected the fish via a pneumatic diversion gate into a holding facility. Fish captured in the West fishway were directed to a hatchery brood-stock collection pond, while in the East fishway captured fish were directed to a 1,236 L holding tank.

Bull trout collected in the East fishway were tagged immediately after capture. Those collected in the West fishway were tagged at the end of the 24 hour trapping session when the hatchery pond was processed for fish. Bull trout captured in the West fishway were subsequently transported over to the East fishway tagging facility. The collected bull trout were netted from the holding tank and transferred to an anesthetic tank containing a 90 mg/L solution of tricaine methanesulfonate (MS-222) and a few drops of Stress Coat (Aquarium Pharmaceuticals, Inc. Chalfont, PA). After 1.5 to 2.0 minutes, the fish lost equilibrium and was considered to be adequately anesthetized for surgical radio tag implantation. The fish was then removed from the solution, weighed, measured, and placed in a wet V-shaped trough for tagging (coated with Stress Coat to minimize scale loss and maintain the exterior mucous coat). A tube was placed in the fish's mouth, supplying cool river water and MS-222 (45 mg/L), aerating the gills and maintaining anesthesia during the tagging procedure. A small (1 cm<sup>2</sup>) clip was taken from the upper lobe of the caudal fin, placed in non-denatured alcohol, and sent to the USFWS for genetic analyses. Four to five scales were removed and placed in a scale book, which was sent to WDFW for fish age analyses.

Radio tag surgical implantation methods were similar to those described in Adams et al. (1998) and Summerfelt and Smith (1990), using the "shielded needle" surgical implantation technique. In addition, intraperitoneal antibiotic was pipetted (50 µL) into the incision to prevent infection. A PIT tag was also inserted into the body cavity during radio-tag implantation. The incision was closed with four to five interrupted, absorbable sutures (3-0 braided Coated Vicryl, Ethicon Corp.) evenly spaced across the incision. The antenna was then attached to the side of the fish with a single suture approximately 1 cm posterior to the antenna exit site. The incision site was cleaned, and a small amount of a cyanoadhesive compound (Vetbond) was applied to the incision and antenna exit site to secure the sutures in place. The fish was then transferred to a recovery tank (a cooler, supplied with flow-through river-water, and supplied with oxygen through an air stone) located on the back of a pickup truck. Approximately one minute before the procedure was complete the MS-222 was removed from the water flushing over the gills to begin the recovery process. Surgical equipment was disinfected with a diluted germicidal solution between each fish tagged.

After the surgery was complete, the flow-through water was detached from the recovery tank, and the fish was quickly transported to the release site. At the release site, the air stone was removed and the recovery tank was placed into the river. The tank was gently rolled onto its side and the lid was opened allowing the fish to swim free of the tank. The swimming behavior of the fish was observed and any abnormalities were noted. All fish were released at the Starr Boat Launch, which was chosen as a release site because it was the closest possible release point to the dam accessible by vehicle, but that was also outside of the influence of forebay hydraulics (including spill and bypass entrainment flows) to reduce the potential for fall back of newly tagged fish.

### **5.1.2 Telemetry monitoring**

A combination of aerial and underwater antennas was used to detect tagged bull trout at the Wells Project, to identify passage routes and times and determine direction of travel (upstream/downstream). Three aerial antennas monitored the mainstem Columbia River, 3 miles downstream of the dam, to detect any movements of bull trout out of the study area. Two aerial

stations, located immediately downstream of the dam on each side of the river, monitored movements within the Wells tailrace. Five combined aerial antennas monitored movements in the Wells forebay. Underwater dipole antennae arrays were deployed into each of five spillbays (2, 4, 6, 8, and 10) where spring/summer bypass spill is typically released. In each spillbay, a dipole antenna was mounted on each of the left and right bulkhead tracks at approximately 10 ft above the bottom of the spillbay intake floor. In addition, on gates 2 and 10, paired dipole antennas were deployed approximately 10 ft below the water surface to monitor spill water passing via the sluice gates. Nine underwater antennas were deployed within each fishway to monitor bull trout approach, ascent, and exit timing.

To assess bull trout movements into and out of the Wells Reservoir, fixed-telemetry monitoring sites were established at the mouths of the Methow and Okanogan rivers. Two antennas were deployed for each tributary to determine the direction of fish movements. Other researchers were conducting radio telemetry studies on bull trout in the mid-Columbia reach concurrent with the Douglas PUD study, and fixed telemetry arrays were present at Rock Island and Rocky Reach dams, and at the mouths of the Wenatchee and Entiat rivers located downstream of the Wells Project. Bull trout tagged by the USFWS and Chelan PUD were monitored at the Wells Project and observations within Project boundaries are included in this document where applicable to the Wells Project Bull Trout Plan objectives.

Radio-tagged bull trout were mobile tracked while in the Wells Project Area. Periodic mobile tracking was also used to confirm the presence of bull trout within tributaries and to track fish within the reservoirs. Mobile tracking methods included aircraft, boat, vehicle, and foot surveys. Tracking data were compiled continuously throughout the year to determine fish locations, tag status, and the need to deploy tag recovery operations in the Wells Project Area. Douglas PUD conducted tracking in the Wells Reservoir and surrounding areas. The USFWS conducted several mobile surveys of the Methow River subbasin as part of their concurrent study, and provided Douglas PUD with the location and date for Wells Dam radio-tagged bull trout detections. Similarly, Chelan PUD monitored Wells Dam radio-tagged bull trout frequencies during several of their mobile tracking surveys in the Entiat and the Wenatchee river subbasins.

#### 5.1.2.1 Data processing

Fish detection data were downloaded from the Lotek receivers at the fixed telemetry arrays a minimum of twice per month, and more often if receiver memory began to exceed capacity prior to the scheduled downloads. Telemetry array systems (i.e., antennas, amplifiers, power inverters, and receivers) were tested periodically during the study to ensure correct operation and function.

Data stored by Lotek receivers were downloaded to a laptop computer as hex-encoded files and converted to standard ASCII format using software developed by LGL Limited. This software assessed several diagnostics, including the number of invalid records; if the number of invalid records was large, the receiver was downloaded a second time. The software also recorded the distribution of antenna noise by power level, allowing identification and correction of individual antenna issues. Data files were uploaded to the LGL FTP site and subsequently downloaded at the LGL Limited office.

Telemetry Manager Version 3.0 software was used for data processing, as well as programs developed in Visual FoxPro by LGL Limited. Invalid data were censored, including background noise at the Project, records with a signal strength that was below a set threshold, single records for a given frequency-code-location combination, and records prior to the fish release time and date. An operational database summarized arrival and departure times from each detection zone.

## **5.2 Strategy 1-1: Calculation of Incidental Take for Adult Bull Trout**

The Wells Project incidental take analysis stipulates specific statistical analyses for determining the 6-year average annual observed take of bull trout during two separate study periods. The incidental take observed under this study period (2005-2008) was averaged with take observed during the 2001 to 2004 telemetry study period to calculate total Project take. Total take was partitioned by upstream and downstream passage events. Take levels were calculated using data from only the first year (365 days) of tag life for each tagged fish; that is, tag detections occurring outside of this period were not used. Further, capture of each bull trout at Wells Dam for tagging was considered a successful upstream passage event and is included in the take calculations.

Project take was calculated by dividing the number of tagged fish “taken” by the total number of radio-tagged fish detected passing either upstream or downstream through Wells Dam (Douglas PUD 2004). The total number of radio-tagged bull trout detected in the WPA included all fish tagged by Douglas PUD, as well as bull trout tagged by Chelan PUD and the USFWS that were detected moving through Wells Dam.

Take associated with turbine and spillway passage was not calculated for the 19 downstream passage events that occurred within one year of tagging because zero take was observed.

## **5.3 Strategy 1-2: Correlations between adult bull trout passage events and Project operations**

As stipulated in the Bull Trout Plan (Douglas PUD 2004), data were compiled for Project (spill, turbines, reservoir elevations) and ladder operations during times of downstream passage for active tagged fish. Daily average Project operations data were extracted for each date on which a downstream passage event occurred and plotted for each day of the study period to provide context for the data. Although the absence of mortalities associated with Project operations prohibited examination of “take” and potential correlates, passage events were compared to operation variables. The Multivariate Platform in JMP<sup>®</sup> 7 was used to further explore how Project operations were related to downstream passage. A scatterplot matrix of date, total discharge, turbine discharge, total spill, in flow, forebay elevation, TDG (%), water temperature, and downstream passage events of radio-tagged bull trout from 2005-2008 was used to visualize correlations with 95% bivariate normal density ellipses. Further, a pairwise correlations table was used to document the Pearson product-moment correlations for each pair of the *Y* variables, using all available values. The table also provides significance probabilities and compares the correlations with a bar chart.

#### **5.4 Strategy 1-3: Off-season fishway passage of adult bull trout**

The Bull Trout Plan required off-season video counts of fishways at Wells Dam during the entire winter of 2004-2005 to record dates and times of adult bull trout passage and to investigate passage trends in relation to ladder maintenance needs. Off-season video monitoring of both Wells Dam fishways for the 2004-2005 winter period began on November 16, 2004 and continued until April 30, 2005. In addition to the requirements of the Bull Trout Plan, Douglas PUD, in consultation with the USFWS, has continued the off-season video monitoring every year since the winter of 2005 including the winters of 2005-2006, 2006-2007 and 2007-2008.

#### **5.5 Strategy 1-4: Develop plan to address adult bull trout passage problems if identified**

No adult bull trout passage problems have been identified that require a corrective plan.

#### **5.6 Strategy 2-1: Sub-adult bull trout PIT tagging program**

Sub-adult bull trout were defined as fish < 400 mm in length. Douglas PUD provided WDFW with PIT tags and tagging equipment to mark sub-adult bull trout incidentally encountered during certain fish sampling operations, including the WDFW smolt-trapping programs in the Methow and Twisp rivers. In addition to providing PIT tag equipment and training, Douglas PUD facilitated an annual pre-season coordination meeting. WDFW tagged sub-adult bull trout caught during their trapping operations using standard PIT tagging protocols developed and distributed by the Pacific States Marine Fisheries Commission. PIT tag data for all bull trout encountered and tagged were uploaded by WDFW to the PITAGIS database.

Douglas PUD passively monitored Wells Dam fishways for PIT tagged bull trout using a fixed PIT tag detection system developed for salmon and steelhead monitoring. The PIT tag detection system operated year-round during the study period (2005 to 2008). Based on previous testing, the PIT tag detection efficiency was estimated at 99.98% for PIT tagged run of the river steelhead and salmon. The PITAGIS database was queried in an effort to determine whether sub-adult bull trout tagged in the Methow are utilizing the Wells Project.

#### **5.7 Strategy 2-2: Off-season fishway passage of sub-adult bull trout**

The monitoring effort described for Strategy 1-3 (adult bull trout off-season video monitoring) also was used to monitor sub-adult bull trout fishway passage. No sub-adult bull trout were detected during the off-season fishway counting periods. Because no sub-adult fish were counted, an analysis of sub-adult passage trends was not completed and no recommendations for modifying the adult fish ladder maintenance schedule were developed.

#### **5.8 Strategy 3-1: Evaluate bull trout stranding and entrapment**

Douglas PUD contracted with GeoEngineers in March 2005 to develop detailed bathymetric maps of the Wells Project. The maps were produced at a 1-foot contour interval and were combined with Wells Dam operational data to assess potential areas of bull trout entrapment or

stranding. The analysis identified several locations where stranding or entrapment of bull trout could potentially occur, including the Methow River mouth, the Okanogan River mouth, the Kirk Islands, the shallow water habitat in the Columbia River directly across from the mouth of the Okanogan River, Schluneger Flats, and the off-channel areas of the Bridgeport Bar Islands.

On May 18, 2006, Douglas PUD field crews surveys 5 reservoir sites during operational and environmental conditions that could potentially result in bull trout stranding or entrapment. From 11:00 PM May 17 to 8:00 AM May 18, 2006 the Wells Reservoir elevation was reduced to 772 feet msl. Douglas PUD conducted field surveys on May 18 from 10:00 AM to 4:00 PM for bull trout stranding or entrapment. Boat and foot surveys were conducted and included a combination of shoreline transects and inspection of isolated sanctuary pools at all sites to visually identify entrapped or stranded bull trout.

On November 5, 2008 an additional stranding survey was conducted at three of the five sites and one new site identified as having the highest probability of stranding during the 2006 study (Methow River mouth, Okanogan River mouth, Columbia River across from the Okanogan River and Sloniger Flats). The Wells Reservoir elevation during this survey was 772.5 msl. The field survey was conducted from 9:30 AM to 3:00 PM. Foot surveys were conducted and included inspection of sanctuary pools and shoreline areas.

## **5.9 Strategy 4-1: Genetic sampling program**

Douglas PUD provided sampling equipment and facilitated standardized training to collect genetic samples from bull trout incidentally collected as part of several on-going projects. Genetic samples were collected from bull trout captured for this study at Wells Dam. Genetic samples were also taken from bull trout incidentally encountered during other fish sampling operations, including juvenile and sub-adult salmonid trapping activities on the Methow and Twisp rivers. All genetic samples were sent to the USFWS Abernathy Fish Technology Center for storage and future analysis.

## **5.10 Strategy 4-2: Determine locations of Wells Dam bull trout outside the Project Area**

Radio-tagged bull trout detected at Wells Dam were tracked to determine movements after leaving the Wells Project Area. As previously discussed, Douglas PUD worked cooperatively with these agencies to obtain more detailed locations of bull trout that interacted with the Wells Project. Coordination between all research projects included tag frequency coordination and sharing of radio telemetry data sets from fixed antenna arrays and mobile tracking.

Core areas (tributaries) used by radio-tagged bull trout captured or detected at Wells Dam were determined for each fish in each year that a tributary entrance was detected. Each observation of an entry in a given year was used as an independent data point. A unique fish could have more than one tributary selection or none at all. Proportional use of each tributary by all radio-tagged bull trout was determined.

## **6.0 RESULTS**

### **6.1 Strategy 1-1: Adult bull trout telemetry program**

#### **6.1.1 Bull trout tagged by Douglas PUD**

The telemetry program goal was to capture and radio-tag 10 adult bull trout at Wells Dam each year for three years. Total bull trout released with tags were 6, 10, and 10 for 2005, 2006, and 2007, respectively. Trapping effort and catch for each year of operation are presented below in the respective sections.

##### **6.1.1.1 Results from Fish Tagged in 2007**

Ten adult bull trout were captured and tagged between May 19 and June 5, 2007 (Table 6.1-1). Fish were actively collected on the East and West fishway brood-stock collection facilities by WDFW employees. Trapping was conducted on the East fishway from 15 May to 5 June for 20 days and a total of 164 hours. Trapping was conducted on the West fishway from 16 May to 31 May for 6 days and a total of 56 hours. Total trapping effort was 220 hours.

Three mobile tracking surveys were conducted between 15 Aug and 13 Dec, 2007 in the Wells Project Area. Only one tag was detected; #29 on the third and last survey.

There were a total of 22 passage events through Wells Dam in 2007<sup>4</sup> for bull trout tagged by Douglas PUD from 2005 to 2007, including 6 downstream and 16 upstream events (Table 6.1-2). Of these, 2 downstream and 10 upstream events occurred within one year of release.

Detection summaries for each bull trout radio-tagged by Douglas PUD in 2007 are included as Appendix A.

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<sup>4</sup> Note that there were no upstream or downstream passage events of DCPUD-tagged bull trout through the monitoring period in 2008 (ending in July). Only two passage events occurred in 2008 – a CCPUD bull trout tagged in 2006 successfully made both an upstream and downstream passage (Table 6.1-2)

**Table 6.1-1 Radio-tagged bull trout released by Douglas PUD, 2005-2007.**

Tagging Fish				Tributary Use			Last
Year	No.	Ch-Cd	Release	Name	Entrance	Exit	Location
<u>2005</u>							
	1	1-2	May-26	Methow	May-26	none	Tag recovered in Methow R. Oct 13 2005
	2	1-4	Jun-02	Methow	Jun-03	May-11-06	Methow R. confluence Sep 2 2007
	3	1-6	Jun-03	Methow	Jun-07	Nov-10-05	Columbia R. at gateway Aug 24 2007
	4	1-8	Jun-07	Methow	Jun-08	Jun-12-05	Columbia R. at Wells Dam tailrace May 12 2006
	5	1-10	Jun-07	Methow	Jun-19	none	Methow R. Oct 13 2005
	6	1-12	Jun-28	Methow	< 31 Aug	Apr-10-06	Columbia R. below WPA Jun 6 2006
<u>2006</u>							
	11	1-56	May-16	Methow	May-27	Nov-17-06	Columbia R. at gateway Jun 30 2007
	12	1-52	May-16	Methow	May-31	Nov-1-06	Methow R. confluence Oct 3 2007
	13	1-68	May-18	Entiat	Jun-25	Nov-30-06	Entiat R. Sep 5 2007
	14	1-64	May-19	Methow	Jun-14	none	Tag recovered in Methow R. Nov 10 2006
	15	1-58	May-19	Methow	May-24	none	Methow R. confluence Jul 8 2008
	16	1-60	May-21	Methow	May-23	none	Methow R. Oct 11 2006
	17	1-66	May-24	Entiat	Jul-04	unk	Methow R. confluence Jul 6 2008
	18	1-50	May-24	Methow	May-26	none	Tag motionless in Methow R. Jul 18 2007
	19	1-54	May-24	Entiat	Jul-07	unk	Methow R. confluence May 14 2008
	20	1-62	May-24	Methow	May-25	Nov-15-06	Columbia R. below Wells Dam Jul 3 2008
<u>2007</u>							
	21	1-69	May-19	Methow	May-21	Jul-8-08	Columbia R. at Wells Dam forebay Jul 8 2008
	22	1-67	May-20	Methow	May-20	none	Methow R. Nov 27 2007
	23	1-65	May-25	Methow	May-26	Jun-11-07	Tag recovered in Methow R. Jul 20 2007
	24	1-63	May-29	Methow	May-31	none	Tag motionless in Methow R. Jul 20 2007
	25	1-61	Jun-02	Methow	Jun-02	none	Tag recovered in Methow R. Jul 26 2007
	26	1-59	Jun-04	Methow	Jun-07	Apr-10-08	Columbia R. at gateway Apr 11 2008
	27	1-57	Jun-04	Methow	Jun-06	none	Methow R. confluence Jun 25 2007
	28	1-55	Jun-04	Methow	Jun-07	none	Tag recovered in Methow R. Jul 18 2007
	29	1-53	Jun-04	Methow	Jun-07	Nov-17-07	Tag motionless in Columbia R. 1.5 mi above Wells Dam Dec 13 2007
	30	1-51	Jun-05	Methow	Jun-07	none	Methow R. Sep 17 2007



**Table 6.1-2 Radio-tagged bull trout that passed downstream or upstream through Wells Dam, 2005-2008.**

Tag Group	Fish No.	Ch-Cd	Release	Downstream Passage Event				Upstream Passage Event <sup>a</sup>			
				2005	2006	2007	2008	2005	2006	2007	2008
<u>DCPUD 2005</u>											
	1	1-2	May-26					May-26			
	2	1-4	Jun-02		May-11			Jun-2	Jun-17		
	3	1-6	Jun-03			Aug-24		Jun-3			
	4	1-8	Jun-07	Jun-12				Jun-7			
	5	1-10	Jun-07					Jun-7			
	6	1-12	Jun-28		May-13			Jun-28			
<u>DCPUD 2006</u>											
	11	1-56	May-16		Nov-19	Jun-30			May-16	Jun-18	
	12	1-52	May-16			Apr-19			May-16	May-19	
	13	1-68	May-18		May-21				May-18		
	14	1-64	May-19		May-24				May-19, Jun-14		
	15	1-58	May-19						May-19		
	16	1-60	May-21						May-21		
	17	1-66	May-24		May-29				May-24	May-29	
	18	1-50	May-24						May-24		
	19	1-54	May-24		May-24				May-24	May-31	
	20	1-62	May-24		Nov-30	Jun-5, Oct-22			May-24	Jun-3, Jun-22	
<u>DCPUD 2007</u>											
	21	1-69	May-19							May-19	
	22	1-67	May-20							May-20	
	23	1-65	May-25							May-25	
	24	1-63	May-29							May-29	
	25	1-61	Jun-02							Jun-2	
	26	1-59	Jun-04			Apr-11				Jun-4	
	27	1-57	Jun-04							Jun-4	
	28	1-55	Jun-04							Jun-4	
	29	1-53	Jun-04							Jun-4	
	30	1-51	Jun-05							Jun-5	
<u>CCPUD 2005</u>											
	531	14-31	May-31		Jun-29			Jun-25			
	544	14-44	Jun-27		Nov-16				May-23		
	503	14-3	May-30					Jun-17			
<u>CCPUD 2006</u>											
	409	14-171	May-25		Dec-17				Jun-3	May-14	
	412	14-174	May-26		Nov-14				Jun-5	Jun-30	
	418	14-180	May-31			Mar-13			Jun-4	Jun-18	
	422	14-184	Jun-05			Jul-3	May-16		Jun-19	Jul-18	May-27
	426	14-188	Jun-22		Dec-20				Jul-1	Jun-19	
	428	14-190	Jun-29							Jun-10	
<u>CCPUD 2007</u>											
	1034	14-111	May-16							Jun-2	
	1038	14-115	May-24							May-30	
	1039	14-116	May-29							Jun-15	
<u>USFWS 2006</u>											
	204	1-74	Apr-12		Jul-19						
<u>USFWS 2007</u>											
	300	1-83	Jun-20			Jul-5					
<u>USFWS 2008</u>											
	none										
Yearly Count				1	14	9	1	8	18	25	1
Total Count							25				52

Shading indicates event occurred greater than 1 year after release.

<sup>a</sup> one successful passage event for each bull trout tagged by DPUD is included, as per the BTMP.

### 6.1.1.2 Results from Fish Tagged in 2006

Ten adult bull trout were captured and tagged from May 16 to May 24, 2006 (Table 6.1-1). Fish were actively collected on the East and West fishway brood-stock collection facilities by WDFW employees. Trapping was conducted on the East fishway from May 14 to May 24 for 10 days and a total of 77 hours. Trapping was conducted on the West fishway from May 14 to May 24 for 6 days and a total of 69 hours. Total trapping effort was 146 hours.

Five mobile tracking surveys were conducted between May 19 and Dec 21, 2006 in the WPA (Table 6.1-3).

There were a total of 20 passage events through Wells Dam in 2006 of bull trout tagged by Douglas PUD from 2005 to 2006, including 8 downstream and 12 upstream events (Table 6.1-2). Of these, 8 downstream and 11 upstream events occurred within one year of release.

**Table 6.1-3 Mobile tracking surveys conducted by Douglas PUD, 2006.**

Date	Survey Type	Location	Tag numbers detected
19 May 2006	Truck	Wells forebay to Methow confluence	none
23 May 2006	Boat	Wells tailrace to gateway station	none
23 May 2006	Truck	Wells forebay to Methow confluence	11, 12, 13, 15, 16
19 Sep 2006	Boat	Wells tailrace	one non-DCPUD
21 Dec 2006	Boat	Wells tailrace to Chelan Falls	11, 20, one non-DCPUD

### 6.1.1.3 Results from Fish Tagged in 2005

Six adult bull trout were captured and tagged between May 26 and June 21, 2005 (Table 6.1-1). Fish were actively collected on the East and West fishway brood-stock collection facilities by WDFW employees. Trapping was conducted on the East fishway from May 26 to June 21 for 15 days and a total of 208 hours. Trapping was conducted on the West fishway from June 19 to June 21 for 3 days and a total of 24 hours. Total trapping effort was 232 hours.

Five mobile tracking surveys were conducted between July 20 and December 23, 2005 in the Wells Project. No tagged bull trout were detected on any of these surveys.

There were a total of 7 passage events through Wells Dam in 2005 of bull trout tagged by Douglas PUD in 2005, including 1 downstream and 6 upstream events (Table 6.1-2). Of these, 1 downstream and 6 upstream events occurred within one year of release.

### 6.1.2 Bull trout tagged by Chelan PUD

Twenty-four bull trout tagged by Chelan PUD have been detected in the WPA, including eleven fish tagged in 2005, nine fish tagged in 2006, and four fish tagged in 2007.

There were a total of 2 passage events through Wells Dam in 2008 of bull trout tagged by Chelan PUD from 2005 to 2007, including 1 downstream and 1 upstream event (Table 6.1-2). Of these, 0 downstream and 0 upstream events occurred within one year of release.

There were a total of 10 passage events through Wells Dam in 2007 of bull trout tagged by Chelan PUD from 2005 to 2007, including 2 downstream and 8 upstream events (Table 6.1-2). Of these, 1 downstream and 5 upstream events occurred within one year of release.

There were a total of 11 passage events through Wells Dam in 2006 of bull trout tagged by Chelan PUD from 2005 to 2006, including 5 downstream and 6 upstream events (Table 6.1-2). Of these, 3 downstream and 6 upstream events occurred within one year of release.

There were a total of 2 passage events through Wells Dam in 2005 of bull trout tagged by Chelan PUD in 2005, including 0 downstream and 2 upstream events (Table 6.1-2). Of these, 0 downstream and 2 upstream events occurred within one year of release.

### 6.1.3 Bull trout tagged by US Fish and Wildlife Service

Two bull trout tagged by USFWS were detected making movements through the Wells Project, including one fish tagged in 2006 (Ch 1, codes 74 and 76) and one fish tagged in 2007 (Ch 1, code 83).

There was a total of 1 passage event through Wells Dam in 2007 of bull trout tagged by the USFWS from 2005 to 2007, including 1 downstream and 0 upstream events (Table 6.1-2). Of these, 1 downstream and 0 upstream events occurred within one year of release.

There was a total of 1 passage event through Wells Dam in 2006 of bull trout tagged by the USFWS from 2005 to 2006, including 1 downstream and 0 upstream events (Table 6.1-2). Of these, 1 downstream and 0 upstream events occurred within one year of release.

There were no passage events through Wells Dam in 2005 of bull trout tagged by the USFWS in 2005 (Table 6.1-2).

#### **6.1.4 Results from 2001 to 2004 bull trout telemetry project (BioAnalysts, Inc. 2004)**

Tagged migratory adult bull trout successfully move both upstream and downstream past the Project. From the 79 bull trout radio-tagged in 2001 and 2002 at Rock Island, Rocky Reach, and Wells dams, five bull trout passed downstream through Wells Dam with no documented mortality. Two of these events occurred within 1 year of release.

Between 2001 and 2003, a total of 10 (2 tagged at Rock Island, 4 Rocky Reach, 4 Wells), 11 ( 5 Rocky Reach, 4 Wells, 2 from 2001), and 1 (1 Wells) tagged bull trout were detected moving upstream of the project, respectively. Nineteen of these events occurred within 1 year of release.

Adult bull trout migrating upstream of Wells Dam appear to be destined for the Methow River. Between 2001 and 2003, no bull trout selected the Okanogan system (one bull trout moved into the Okanogan, but left shortly thereafter and moved into the Methow system).

#### **6.1.5 Wells Project 6-year-average Incidental take calculation (2000 to 2004 and 2005 to 2008 monitoring years combined)**

Of all tags released from 2005 to 2007 by Douglas PUD, Chelan PUD, and the USFWS, there were 25 downstream passage events and 52 upstream passage events by radio-tagged bull trout recorded at Wells Dam (n=40 individuals) (Table 6.1-2). Of these, 17 downstream and 41 upstream passage events occurred within one year of release (Table 6.1-4). Of all tags released from 2001 to 2004, there were 2 downstream passage events and 41 upstream passage events by radio-tagged bull trout recorded or tagged at Wells Dam (BioAnalysts, 2004). Of these, 2 downstream and 38 upstream passage events occurred within one year of release (Table 6.1-4). There were 27 downstream and 93 upstream total passage events at Wells Dam by radio-tagged bull trout, and 19 downstream and 79 upstream passage events at Wells Dam by radio-tagged bull trout within one year of release over the six years of tagging and eight years of monitoring (Table 6.1-4). Radio-tagged bull trout passed downstream through the turbines or spillways as no downstream passage events were recorded via the fishways. No bull trout injury or mortality was observed at the Wells Project during either study period, by fish passing within one year of release or by fish passing greater than 1 year, as indicated by subsequent movement and detections. Therefore, in-depth take calculations and analysis are not necessary as the observed take over eight years of monitoring was zero out of 98 passage events occurring within one year of tagging.

**Table 6.1-4 Summary of downstream and upstream passage events of radio-tagged bull trout within one year of release through Wells Dam, 2001-2007.**

Tag Group	Downstream Passage Event			Upstream Passage Event <sup>a</sup>		
	Total	Survived	Died	Total	Survived	Died
<u>DCPUD 2005</u>	3	3	0	6	6	0
<u>DCPUD 2006</u>	7	7	0	11	11	0
<u>DCPUD 2007</u>	1	1	0	10	10	0
<u>CCPUD 2005</u>	0	0	0	3	3	0
<u>CCPUD 2006</u>	4	4	0	8	8	0
<u>CCPUD 2007</u>	0	0	0	3	3	0
<u>USFWS 2005</u>	0	0	0	0	0	0
<u>USFWS 2006</u>	1	1	0	0	0	0
<u>USFWS 2007</u>	1	1	0	0	0	0
<u>USFWS 2008</u>	0	0	0	0	0	0
subtotal (2005-2008)	17	17	0	41	41	0
<u>CCPUD 2001</u> <sup>b</sup>	0	0	0	20	20	0
<u>CCPUD 2002</u> <sup>b</sup>	2	2	0	18	18	0
subtotal (2001-2004)	2	2	0	38	38	0
Totals	19	19	0	79	79	0

<sup>a</sup> one successful passage event for each bull trout tagged by DPUD is included, as per the BTMP.

<sup>b</sup> BioAnalysts, Inc. 2004

## **6.2 Strategy 1-2: Correlations between passage events and Project operations**

Data were compiled for Project (spill, turbines, and reservoir elevations) and ladder operations for dates of downstream passage events of radio-tagged fish (Table 6.2-1). Mean daily discharge was 124 kcfs, and ranged from 49 kcfs to 247 kcfs for the dates on which a radio-tagged bull trout passed downstream through Wells Dam. Discharge via spill was typically below 16 kcfs and often zero during downstream passage events. Mean daily forebay elevation and ladder operations varied very little by day, month, or seasonal basis during the study and as a result did not appear to have a relationship to downstream passage events at Wells Dam. Similarly, downstream passage events occurred over a large range of discharge conditions and turbine/spill operations that were consistent with the normal range of conditions at Wells Dam on a seasonal basis (Figure 6.2-1). These data indicate that there was no apparent direct relationship between the timing of downstream events and discharge/operational conditions at Wells Dam.

Further review of multivariate analyses supports the observations that no direct relationship exists between downstream passage events and Project operations. A scatterplot matrix of associated variables (e.g., total spill) and downstream passage events show that downstream passage events had no apparent relationship to any variables related to Project operations (Figure 6.1-2). No correlation values were considered to be large (0.5 to 1.0 or -0.5 to -1.0), and none were of statistical significance (Table 6.2-1).

The monthly timing of downstream passage events does however exhibit a seasonal trend (Figure 6.2-3) that appears to be more related to their biological life history of moving into and out of spawning tributaries. On a monthly basis, downstream passage events demonstrated a bimodal pattern of occurrence at Wells Dam with the peak number of events occurring in May and November.

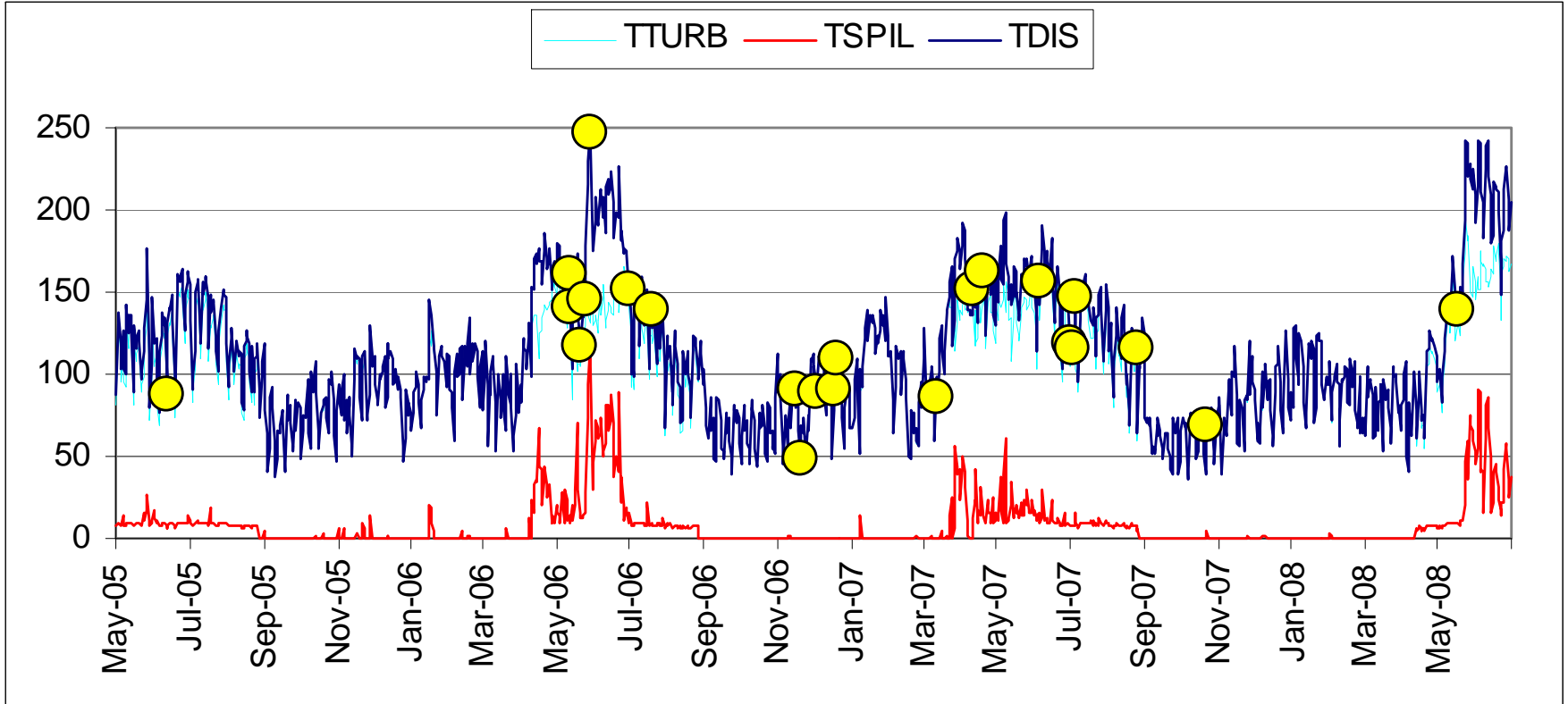
**Table 6.2-1 Project operations data for dates on which a bull trout passed downstream through Wells Dam, 2005-2008.**

Downstream Date	Total Discharge	Turbine Discharge	Spill Discharge	Forebay Elevation	Total Inflow
Jun-12-05	87.5	80.5	7.0	777.7	74.2
May-11-06	157.7	144.1	13.6	780.7	157.6
May-13-06	141.2	131.2	10.0	779.5	140.1
May-21-06	117.0	105.2	11.8	772.2	117.3
May-24-06	144.9	129.2	15.7	776.3	158.4
May-24-06	144.9	129.2	15.7	776.3	158.4
May-29-06	246.9	131.8	115.1	780.4	250.0
Jun-29-06	152.0	141.9	10.1	779.9	148.6
Jul-19-06	139.7	129.8	9.9	779.4	131.1
Nov-14-06	96.8	96.7	0.1	780.5	100.9
Nov-16-06	80.0	80.0	0.0	778.6	74.0
Nov-19-06	48.6	48.6	0.0	779.5	50.7
Nov-30-06	89.4	89.4	0.0	778.7	88.4
Dec-17-06	91.0	91.0	0.0	780.5	99.9
Dec-20-06	109.6	109.6	0.0	780.8	114.2
Mar-13-07	85.4	85.4	0.0	778.9	79.1
Apr-11-07	151.7	138.5	13.2	780.8	155.1
Apr-19-07	162.3	146.5	15.8	780.8	161.9
Jun-5-07	157.0	140.7	16.3	780.4	157.2
Jun-30-07	118.4	110.4	8.1	780.5	121.9
Jul-3-07	115.7	107.5	8.2	780.7	132.8
Jul-5-07	146.8	130.8	16.0	780.9	148.7
Aug-24-07	116.0	108.2	7.8	779.9	117.2
Oct-22-07	68.3	64.2	4.1	779.7	80.7
May-16-08	139.4	129.4	10.0	780.2	145.6
Mean	124.3	112.0	12.3	779.4	126.6
Median	118.4	110.4	9.9	779.9	131.1
Max	246.9	146.5	115.1	780.9	250.0
Min	48.6	48.6	0.0	772.2	50.7

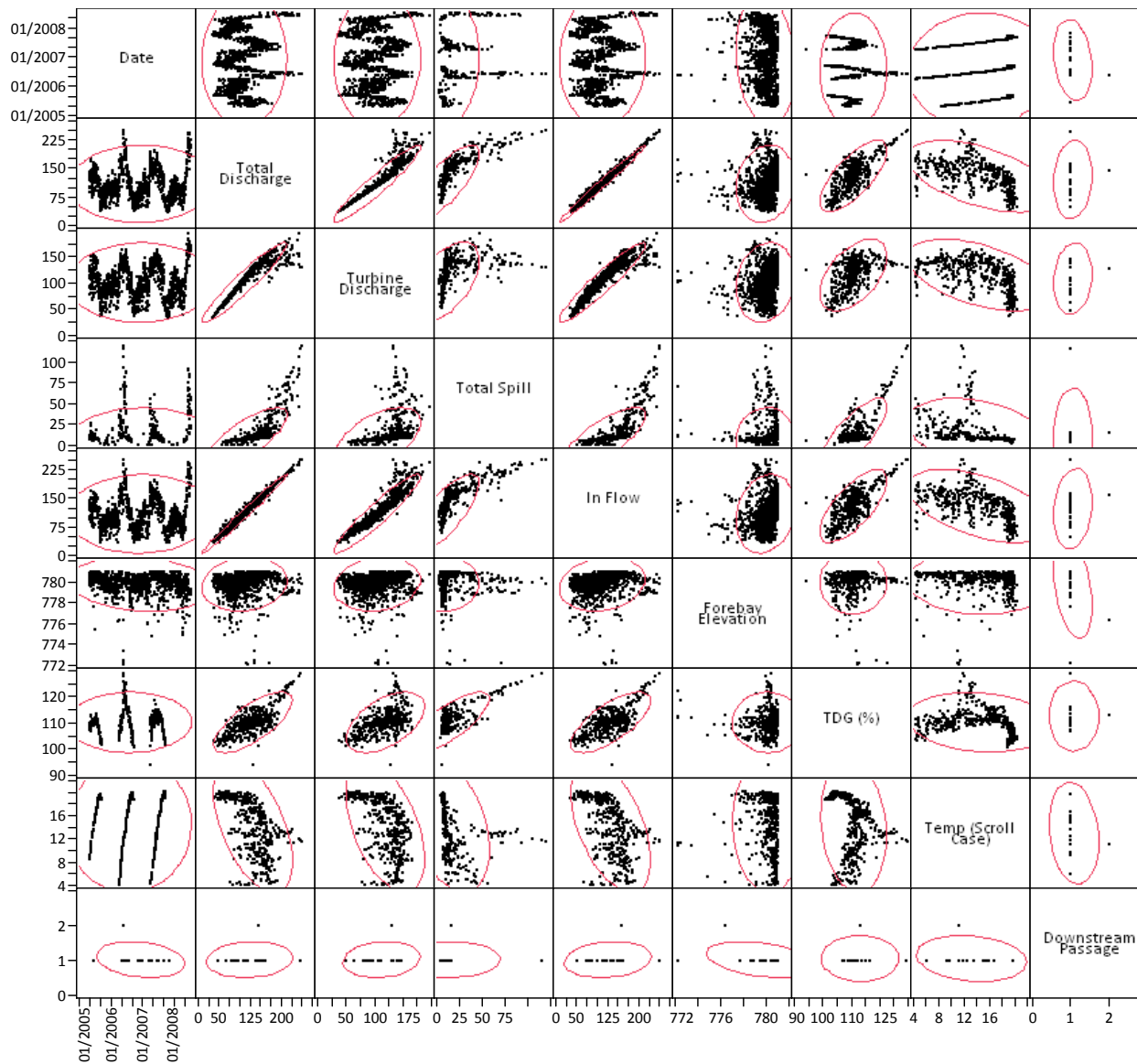
**Table 6.2-2 Project operations data for dates on which a bull trout passed downstream through Wells Dam, 2005-2008.**

Variable	by Variable	Correlation	Count	Signif Prob	Plot Correlation
Downstream Passage	Date	-0.2027	23	0.3535	
Downstream Passage	Total Discharge	0.1148	23	0.6019	
Downstream Passage	Turbine Discharge	0.1486	23	0.4987	
Downstream Passage	Total Spill	0.0319	23	0.8853	
Downstream Passage	In Flow	0.1738	23	0.4276	
Downstream Passage	Forebay Elevation	-0.3484	23	0.1032	
Downstream Passage	TDG (%)	0.0009	14	0.9976	
Downstream Passage	Temp (Scroll Case)	-0.1610	14	0.5823	

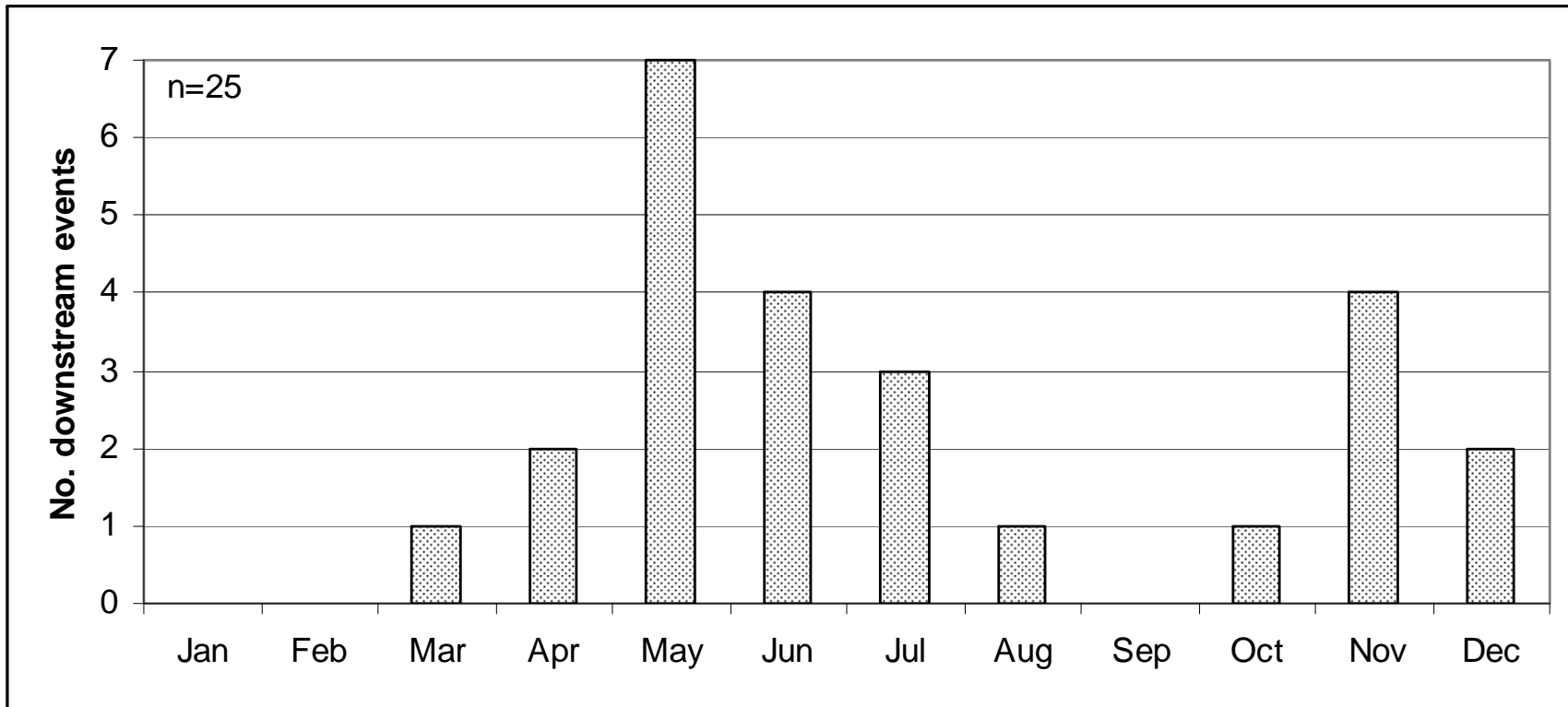




**Figure 6.2-1 Mean daily values for turbine, spill, and combined discharge at Wells Dam during bull trout monitoring at Wells Dam. Circles indicate downstream passage events of bull trout.**



**Figure 6.2-2** Scatterplot matrix of Project operation variables and downstream passage events of radio-tagged bull trout at Wells Dam, 2005-2008.



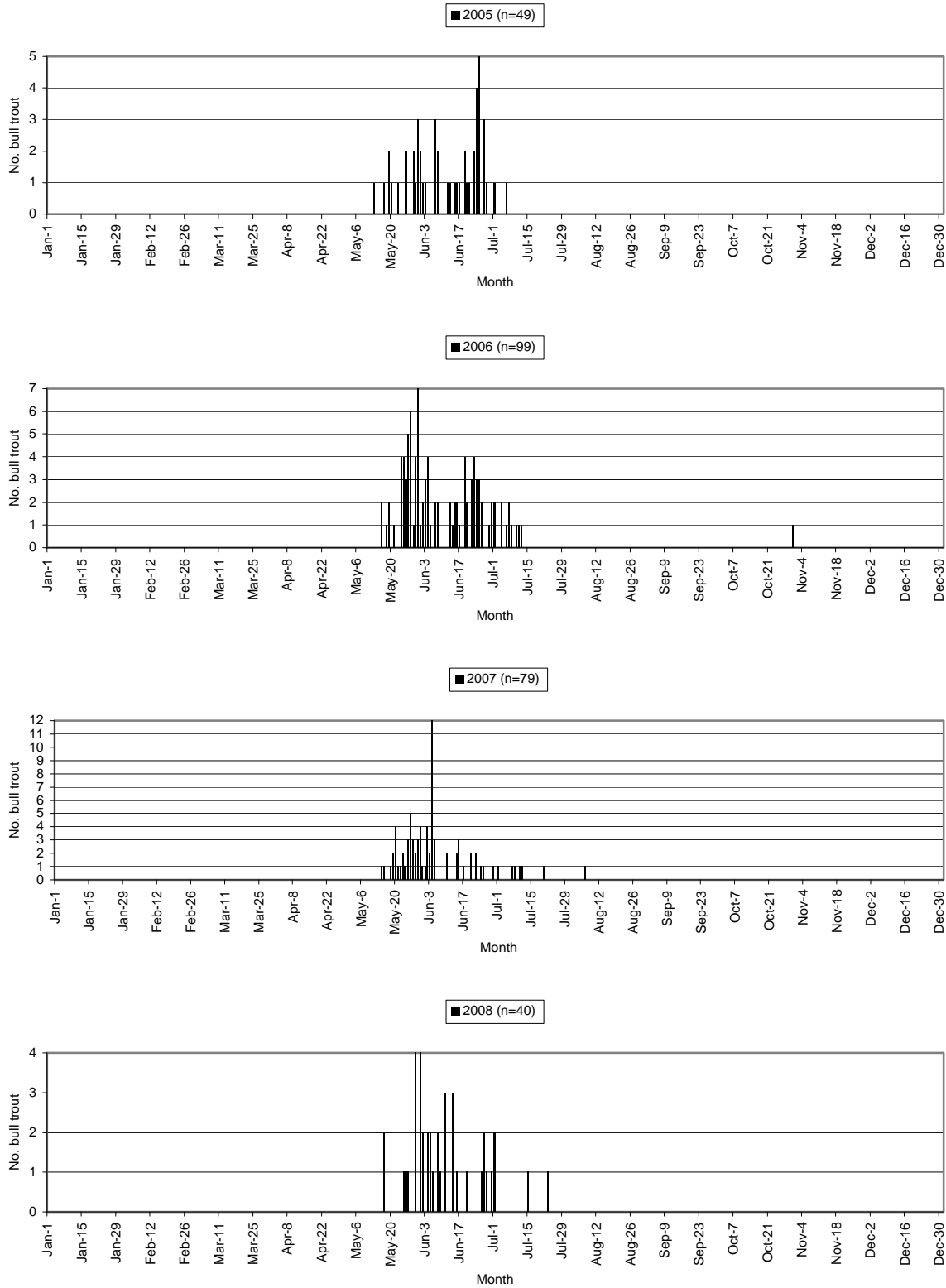
**Figure 6.2-3 Distribution of downstream passage events of bull trout passing through Wells Dam by month.**

### 6.3 Strategy 1-3: Off-season fishway passage of adult bull trout

In addition to regular season monitoring, off-season video monitoring of both Wells Dam fishways was conducted continuously for the 2005-2006, 2006-2007, and 2007-2008 winter periods (November 16 - April 30). During these continuously monitored periods, no adult bull trout were observed utilizing the fishways (Figure 6.3-1). Further, all fishway outages for annual service occurred within the off-season period and therefore did not overlap in timing with any upstream passage events (Table 6.3-1).

**Table 6.3-1 Fishway outage periods at Wells Dam, 2005-2007.**

Year	East	West
2005	-	1 to 31 Dec
2006	1 to 10 Jan, 20 to 31 Dec	16 Jan to 23 Feb
2007	1 Jan to 8 Mar, 1 to 31 Dec	12 to 30 Mar



**Figure 6.3-1 Daily count of bull trout passing upstream through Wells Dam, 2005-2008. Bull trout captured for tagging are included.**

## 6.4 Strategy 1-4: Modifications to passage facilities or operations

There has been no passage issues identified that limit upstream or downstream passage of adult bull trout at Wells Dam. Therefore, there is no need for modifications to current passage facilities or operations.

## 6.5 Strategy 2-1: Sub-adult PIT tagging program

Douglas PUD passively collected information from all PIT tagged fish, including bull trout, as they passed through the fishways at Wells Dam. Douglas PUD also scanned all bull trout incidentally captured at rotary screw traps and adult brood collection facilities. The information collected at the dam and in the tributaries was posted on the PTAGIS website, which is operated and maintained by the Pacific States Marine Fisheries Commission.

No sub-adult bull trout were observed or captured during the 2005 to 2007 study period at Wells Dam. Douglas PUD provided support to WDFW for PIT tagging bull trout collected at two off-site smolt collection facilities (Table 6.5-1). During the three years of study 67 sub-adult bull trout were PIT tagged at two Methow River basin trap sites. The PTAGIS database shows that none of these PIT tagged bull trout have since been detected, either at Wells Dam or any other location where monitoring takes place throughout the Columbia Basin.

**Table 6.5-1 Sub-adult bull trout PIT tagged in the Methow Basin, 2005-2008 (data from C. Snow, WDFW).**

Year	Collection/tag site	# PIT tagged	# DNA sampled
2007	Methow River trap	4	4
2008	Methow River trap	1	1
2005	Twisp River trap	16	16
2006	Twisp River trap	20	10
2007	Twisp River trap	10	10
2008	Twisp River trap	16	10

## 6.6 Strategy 2-2: Off-season fishway passage of sub-adult bull trout

In addition to regular season monitoring (May 1 – November 15), off-season video monitoring of both Wells Dam fishways was conducted for the 2005-2006, 2006-2007, and 2007-2008 winter periods (November 16 - April 30). No sub-adult bull trout were observed utilizing the fishways during off-season video monitoring.

## 6.7 Strategy 3-1: Inflow patterns, reservoir elevations, and backwater curves

On May 18, 2006 and again on November 5, 2008, Douglas PUD conducted stranding surveys intended to document whether or not bull trout are becoming stranding in the Wells Reservoir during deeper than normal reservoir operations. The survey locations were selected based upon an analysis of detailed bathymetric maps produced in 2005 combined with Wells Reservoir

hydraulic information. This effort identified several locations where stranding of sub-adult bull trout could potentially occur. Six total potential stranding locations were identified. These locations were the Methow River mouth, the Okanogan River mouth, the Kirk Islands, the shallow water habitat in the Columbia River directly across from the mouth of the Okanogan River, Schluneger Flats and the off-channel areas of the Bridgeport Bar Islands. Boat and foot surveys were conducted and included a combination of shoreline transects and inspection of isolated sanctuary pools. No bull trout were observed during either of the two surveys which suggests that bull trout are able to avoid stranding and entrapment areas in the event of a Wells reservoir drawdown.

## **6.8 Strategy 4-1: Genetic sampling program**

From 2005 to 2007, 26 genetic samples were collected from adult bull trout during radio-tagging operations at Wells Dam. Additional genetic samples (n=61) were collected from sub-adult bull trout captured during smolt trapping operations conducted by the WDFW on the Twisp and Methow rivers (data provided by C. Snow, WDFW). All samples were sent to the USFWS Abernathy Fish Technology Center for analysis. Genetic analysis results are not yet available.

## **6.9 Strategy 4-2: Destination locations of Wells Dam bull trout**

All six bull trout tagged in 2005 by Douglas PUD entered the Methow River (Table 6.1-1). One fish (#4) exited after five days and moved downstream of Wells Dam. One fish (#2) was detected moving into the Methow River again in 2006 (Table 6.9-1).

Seven of the 10 bull trout tagged in 2006 by DPUD entered the Methow River, and three entered the Entiat River during the year tagged (Table 6.1-1). Six of these fish were also detected entering a tributary in 2007 and one in 2008, however two fish entered a different tributary than previously selected (Table 6.9-1).

All 10 bull trout tagged in 2007 by DPUD entered the Methow River during the year tagged (Table 6.1-1).

In total, 26 bull trout tagged by DPUD made 34 tributary entries over the study period (Table 6.9-1). Of these, 30 (88% of 34) chose the Methow River and four (12% of 34) the Entiat River.

There were 25 tributary entries detected over the study period for the 12 bull trout tagged by CPUD from 2005 to 2008 that were detected at Wells Dam (Table 6.9-1). Of these, 21 (84% of 25) chose the Methow River, 2 (8%) the Entiat River, and 2 (8%) the Wenatchee River. Three of these fish entered a different tributary than previously selected.

For the 2 bull trout tagged by USFWS from 2006 to 2007 that were detected at Well Dam, there were no subsequent observations of tributary entry after being captured and tagged in the Methow River.

There were 59 tributary entries detected over the study period with 51 (86.4%) in the Methow River, 6 (10.2%) in the Entiat River, and 2 (3.4%) in the Wenatchee River. Of 38 bull trout tracked with tributary entries, 6 chose a different tributary than previously selected.

**Table 6.9-1 Tributary use of radio-tagged bull trout detected at Wells Dam, 2005-2008.**

Tag Group	Fish No.	Ch-Cd	Tributary Use <sup>a</sup>			
			2005	2006	2007	2008
<u>DCPUD 2005</u>						
	1	1-2	Methow			
	2	1-4	Methow	Methow		
	3	1-6	Methow			
	4	1-8	Methow			
	5	1-10	Methow			
	6	1-12	Methow			
<u>DCPUD 2006</u>						
	11	1-56		Methow	Methow	
	12	1-52		Methow	Methow	
	13	1-68		Entiat	Entiat	
	14	1-64		Methow		
	15	1-58		Methow		
	16	1-60		Methow		
	17	1-66		Entiat	Methow	
	18	1-50		Methow		
	19	1-54		Entiat	Methow	Methow
	20	1-62		Methow	Methow	
<u>DCPUD 2007</u>						
	21	1-69			Methow	
	22	1-67			Methow	
	23	1-65			Methow	
	24	1-63			Methow	
	25	1-61			Methow	
	26	1-59			Methow	
	27	1-57			Methow	
	28	1-55			Methow	
	29	1-53			Methow	
	30	1-51			Methow	
<u>CCPUD 2005</u>						
	531	14-31	Methow	Wenatchee	Wenatchee	
	544	14-44		Methow	Entiat	
	503	14-3	Methow	Methow	Methow	Methow
<u>CCPUD 2006</u>						
	409	14-171		Methow	Methow	
	412	14-174		Methow	Entiat	Methow
	418	14-180		Methow	Methow	
	422	14-184		Methow	Methow	Methow
	426	14-188		Methow	Methow	
	428	14-190			Methow	
<u>CCPUD 2007</u>						
	1034	14-111			Methow	
	1038	14-115			Methow	
	1039	14-116			Methow	
<u>USFWS 2006</u>						
	204	1-74		Methow		
<u>USFWS 2007</u>						
	300	1-83		Methow		
<u>USFWS 2008</u>						
	none					



## **7.0 CONCLUSIONS**

Through the implementation of the strategies outlined in the Bull Trout Plan, six years of tagging, and eight years of monitoring, Douglas PUD has not identified any project-related impacts to adult or sub-adult bull trout from passage through the Wells Project, nor by stranding/entrapment due to lowering of the reservoir elevation. Douglas PUD has also determined there are no apparent correlations between project operations and downstream passage events, and that there is no upstream movement of adult bull trout through the Wells Dam fishways during the off-season period of November 16 through April 30. Bull trout captured and tagged at Wells Dam were radio-tracked to the Methow and Entiat Core Areas during spawning periods, and have also demonstrated movement between these systems by successfully passing upstream or downstream through Wells Dam.

Currently, Douglas PUD is working with the USFWS on a package of bull trout monitoring and management measures that can be incorporated into the new operating license for the Wells Project. The USFWS will be assessing the effect of relicensing the Project on bull trout within the context of ESA section 7. These proposed measures are intended to be consistent with the Bull Trout recovery plan being developed by the USFWS.

## **8.0 ACKNOWLEDGMENTS**

Douglas PUD Fish Enumerators Tanya Gibson, Sylvia Robertson, and Betty Walters were supportive in providing detailed accounts of bull trout passage throughout the study. Radio-tagging was conducted by Dave Robichaud, Megan Mathews, and Josh Murauskas in the years 2005, 2006, and 2007, respectively. Lynda Andrew conducted radio telemetry station downloads over the entire study. Mary Mayo, Bao Le, and Shane Bickford made significant editorial contributions throughout the reporting process.

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## **Appendix A**

### **Detection History Summaries for each Bull Trout Detected in the Wells Project Area**

**The summary of detection histories for each bull trout tagged by Douglas PUD in 2007 is as follows:**

Fish 21 (Code 69)

Released in Columbia R. 19 May 2007. Entered Methow R. 21 May 2007, and exited 8 Jul 2008. Last detected in the Wells Dam forebay 8 Jul 2008. Fish 21 successfully made *one upstream* passage at Wells Dam during its detection history.

Fish 22 (Code 67)

Released in Columbia R. 20 May 2007. Entered Methow R. 20 May 2007. Last detected in the Twisp R. 27 Nov 2007. Fish 22 successfully made *one upstream* passage at Wells Dam during its detection history.

Fish 23 (Code 65)

Released in Columbia R. 25 May 2007. Entered Methow R. 26 May, and exited 11 Jun 2007. Detected at mouth of Okanogan R. 12 Jun 2007. Re-entered Methow R. between 13 and 16 Jun 2007. Tag recovered in Twisp R. 20 Jul 2007. Fish 23 successfully made *one upstream* passage at Wells Dam during its detection history.

Fish 24 (Code 63)

Released in Columbia R. 29 May 2007. Entered Methow R. prior to 31 May 2007. Last detected motionless in Twisp R. 20 Jul 2007. Fish 24 successfully made *one upstream* passage at Wells Dam during its detection history.

Fish 25 (Code 61)

Released in Columbia R. 2 Jun 2007. Entered Methow R. 2 Jun 2007. Tag recovered in West Fork Methow R. 26 Jul 2007. Fish 25 successfully made *one upstream* passage at Wells Dam during its detection history.

Fish 26 (Code 59)

Released in Columbia R. 4 Jun 2007. Entered Methow R. 7 Jun 2007, and exited 10 Apr 2008. Passed downstream through Wells Dam on 11 Apr 2008. Last detected leaving the WPA at the gateway station on 11 Apr 2008. Fish 26 successfully made *one upstream* and *one downstream* passage through Wells Dam during its detection history.

Fish 27 (Code 57)

Released in Columbia R. 4 Jun 2007. Entered Methow R. 6 Jun 2007. Last detected at mouth of Methow R. 25 Jun 2007. Fish 27 successfully made *one upstream* passage at Wells Dam during its detection history.

Fish 28 (Code 55)

Released in Columbia R. 4 Jun 2007. Entered Methow R. 7 Jun 2007. Tag recovered in Twisp R. 18 Jul 2007. Fish 28 successfully made *one upstream* passage at Wells Dam during its detection history.

Fish 29 (Code 53)

Released in Columbia R. 4 Jun 2007. Entered Methow R. 7 Jun and exited 17 Nov 2007. Last detected motionless in Columbia R. 1.7 miles upstream of Wells Dam 13 Dec 2007. Fish 29 successfully made *one upstream* passage at Wells Dam during its detection history.

Fish 30 (Code 51)

Released in Columbia R. 5 Jun 2007. Entered Methow R. 7 Jun. Last detected in Twisp R. 17 Sep 2007. Fish 30 successfully made *one upstream* passage at Wells Dam during its detection history.

**The summary of detection histories for each bull trout tagged by Douglas PUD in 2006 is as follows:**

Fish 11 (Code 56)

Released in Columbia R. 16 May 2006. Entered Methow R. 27 May, and exited on 17 Nov 2006. Passed downstream through Wells Dam between 18 and 19 Nov and exited the WPA at the gateway station on 19 Nov 2006. Approached Wells Dam 22 May 2007 and completed an upstream passage through Wells Dam 18 Jun 2007. Entered Methow R. 19 Jun and exited on 29 Jun 2007. Completed a downstream passage through Wells Dam on 30 Jun and last detected leaving the WPA at the gateway station on 30 Jun 2007. Fish 11 successfully made *two upstream* and *two downstream* passages through Wells Dam during its detection history.

Fish 12 (Code 52)

Released in Columbia R. 16 May 2006. Entered Methow R. 31 May, and exited 1 Nov 2006. Passed downstream through Wells Dam before 19 Apr 2007. Began ascent through fishway and diverted from West fishway trapping facilities to hatchery pond on 19 May 2007. Re-released in Columbia R. 21 May 2007. Entered Methow R. 25 May, and last detected 3 Oct 2007 on upstream antenna at mouth of Methow R. Fish 12 successfully made *two upstream* and *one downstream* passages through Wells Dam during its detection history.

Fish 13 (Code 68)

Released in Columbia R. 18 May 2006. Passed downstream through Wells Dam on 21 May 2006. Detected in Entiat R. between 25 Jun and 2 Nov 2006, and near the confluence between 30 Nov 2006 and 3 Apr 2007. Re-detected in Entiat R. between 7 Jun and 5 Sep (last detection)

2007. Fish 13 successfully made *one upstream* and *one downstream* passage through Wells Dam during its detection history.

Fish 14 (Code 64)

Released in Columbia R. 19 May 2006. Passed downstream through Wells Dam between 19 and 24 May 2006. Passed upstream through Wells Dam on 14 Jun 2006. Entered Methow R. on 14 Jun. Tag recovered in tributary to Twisp R. on 11 Oct 2006. Fish 14 successfully made *two upstream* and *one downstream* passage through Wells Dam during its detection history.

Fish 15 (Code 58)

Released in Columbia R. 19 May 2006. Entered Methow R. 24 May 2006. Last detected at confluence 8 Jul 2008. Fish 15 successfully made *one upstream* passage at Wells Dam during its detection history.

Fish 16 (Code 60)

Released in Columbia R. 21 May 2006. Entered Methow R. on 23 May 2006. Last detected in Methow R. on 11 Oct 2006. Fish 16 successfully made *one upstream* passage at Wells Dam during its detection history.

Fish 17 (Code 66)

Released in Columbia R. 24 May 2006. Passed downstream through Wells Dam between 28 and 29 May, and exited the WPA on 19 Jun 2006. Detected in Entiat R. on 4 Jul 2006. Re-entered the WPA at the gateway station and approached Wells Dam on 28 May 2007. Passed upstream through Wells Dam on 29 May 2007. Entered Okanogan River 9 Jun, and exited on 17 Jun. Entered the Methow R. on 17 Jun 2007, and exited on 25 May 2008. Last detected at Methow confluence on 6 Jul 2008. Fish 17 successfully made *two upstream* and *one downstream* passage through Wells Dam during its detection history.

Fish 18 (Code 50)

Released in Columbia R. 24 May 2006. Entered Methow R. 26 May 2006. Tag detected motionless in Twisp R. on 18 Jul 2007. Fish 18 successfully made *one upstream* passage at Wells Dam during its detection history.

Fish 19 (Code 54)

Released in Columbia R. 24 May 2006. Passed downstream through Well Dam on 24 May 2006. Remained downstream of Wells Dam until leaving the WPA at the gateway station on 30 Jun 2006. Detected in the Entiat R. between 7 Jul and 25 Nov 2006. Entered the WPA 4 May 2007, and passed upstream through Wells Dam on 31 May 2007. Entered Methow R. on 31 May, 2007, and exited on 24 Nov 2007. Re-detected at Methow confluence on 5 May 2008, and



last seen moving upstream on 14 May. Fish 19 successfully made *two upstream* and *one downstream* passage through Wells Dam during its detection history.

#### Fish 20 (Code 62)

Released in Columbia R. 24 May 2006. Entered Methow R. 25 May 2006, and exited between 12 and 15 Nov 2006. Passed downstream through Wells Dam between 16 and 30 Nov 2006. Remained downstream of Wells Project Area from 30 Nov 2006 to 24 May 2007. Approached Wells Dam 29 May 2007, and captured in the West fishway trapping facilities on 3 Jun 2007. Re-released above Wells Dam in Columbia R. 4 Jun. Passed downstream through Wells Dam on or before 5 Jun 2007. Passed upstream through Wells Dam 22 Jun 2007. Entered Methow R. 23 Jun, and exited 19 Oct 2007. Passed downstream through Wells Dam on 22 Oct 2007. Detected downstream of the WPA through 4 Apr 2008. Re-entered the WPA on 28 May 2008 and approached Wells Dam on 29 May 2008. Last detected in below Wells Dam in the WPA 3 Jul 2008. Fish 20 successfully made *three upstream* and *three downstream* passages through Wells Dam during its detection history.

### **The summary of detection histories for each bull trout tagged by Douglas PUD in 2005 is as follows:**

#### Fish 1 (Code 2)

Released in Columbia R. 26 May 2005. Entered Methow R. 26 May 2005. Tag recovered in Methow R. on 13 Oct 2005. Fish 1 successfully made *one upstream* passage at Wells Dam during its detection history.

#### Fish 2 (Code 4)

Released in Columbia R. 2 Jun 2005. Entered Methow R. on 3 Jun 2005. Exited Methow R. between 6 Mar and 11 May 2006 when it passed downstream through Wells Dam. Passed upstream through Wells Dam on 17 Jun 2006. Re-entered Methow R. 13 Jul 2006. Last detected at mouth of Methow R. on 2 Sep 2007. Fish 2 successfully made *two upstream* and *one downstream* passage through Wells Dam during its detection history.

#### Fish 3 (Code 6)

Released in Columbia R. 3 Jun 2005. Entered Methow R. on 7 Jun, and exited on 10 Nov 2005. Detected in Columbia R. near Pateros on 20 Apr 2006, and last detected 24 Aug 2007 exiting the WPA at the gateway station (passed downstream through Wells Dam undetected). Fish 3 successfully made *one upstream* and *one downstream* passage through Wells Dam during its detection history.

#### Fish 4 (Code 8)

Released in Columbia R. 7 Jun 2005. Entered Methow R. on 8 Jun, and then passed downstream through Wells Dam between 8 and 12 Jun 2005. Exited and entered the WPA at the gateway station two times between 24 Oct 2005 and 10 Jan 2006. Last detected in tailrace of Wells Dam on 12 May 2006. Fish 4 successfully made *one upstream* and *one downstream* passage through Wells Dam during its detection history.

#### Fish 5 (Code 10)

Released in Columbia R. 7 Jun 2005. Entered Methow R. 19 Jun 2005, and last detected in Methow R. on 13 Oct 2005. Fish 5 successfully made *one upstream* passage at Wells Dam during its detection history.

#### Fish 6 (Code 12)

Released in Columbia R. 28 Jun 2005. Entered Twisp R. by 31 Aug 2005 (not detected at the confluence). Exited Methow R. 10 Apr 2006, and passed downstream through Wells Dam on 13 May 2006. Last detected in Columbia R. downstream of WPA on 6 Jun 2006. Fish 6 successfully made *one upstream* and *one downstream* passage through Wells Dam during its detection history.

The summary of detection histories for bull trout tagged by Chelan PUD that made up- or down-stream passages through Wells Dam are as follows:

#### Fish 1034 (code 14-111)

Released 16 May 2007 in Columbia R. at Rocky Reach Dam. Entered the WPA at the gateway station on 18 May, and approached Wells Dam on 19 May 2007. Passed upstream through Wells Dam on 2 Jun 2007, and entered the Methow R. on 3 Jun 2007. Tag recovered in Methow R. 26 Jul 2007. Fish 1034 successfully made *one upstream* passage through Wells Dam during its detection history.

#### Fish 1038 (code 14-115)

Released 24 May 2007 in Columbia R. at Rocky Reach Dam. Entered the WPA and approached Wells Dam on 26 May 2007. Passed upstream through Wells Dam on 30 May, and entered the Methow R. on 31 May. Last detected in the Twisp R. 24 Oct 2007. Fish 1038 successfully made *one upstream* passage through Wells Dam during its detection history.

#### Fish 1039 (code 14-116)

Released 29 May 2007 in Columbia R. at Rocky Reach Dam. Entered the WPA at the gateway station on 31 May, and approached Wells Dam on 2 Jun 2007. Passed upstream through Wells Dam on 15 Jun 2007. Detected in Twisp R. between 11 and 18 Jul 2007 (not detected at

confluence). Tag recovered in Methow R. 2 Aug 2007. Fish 1039 successfully made **one upstream** passage through Wells Dam during its detection history.

Fish 409 (code 14-171)

Released 25 May 2006 in Columbia R. at Rocky Reach Dam. Entered the WPA at gateway station and approached Wells Dam on 27 May 2006. Passed upstream through Wells Dam on 3 Jun 2006. Detected in Methow R. on 16 Nov, and exited on 10 Dec 2006. Passed downstream through Wells Dam before 17 Dec 2006. Approached Wells Dam 9 May 2007 and passed upstream through Wells Dam on 14 May 2007. Entered Methow R. 19 May 2007. Last detected in Methow R. on 8 Nov 2007. Fish 409 successfully made **two upstream** passages and **one downstream** passage through Wells Dam during its detection history.

Fish 412 (code 14-174)

Released 26 May 2006 in Columbia R. at Rocky Reach Dam. Entered the WPA and approached Wells Dam on 29 May 2006. Began ascent of Wells Dam, recaptured at the adult trap, and released upstream on 5 Jun 2006. Entered Methow R. on 7 Jun, and exited on 13 Nov 2006. Passed downstream through Wells Dam 14 Nov 2006 and exited the WPA at the gateway station on 21 Nov 2006. Detected in Entiat R. 20 Jul 2007. Approached Wells Dam 2 Sep 2007, but returned to Entiat R. on 11 Sep 2007. Re-entered WPA on 19 Jun 2008, and approached Wells Dam on 20 Jun 2008. Passed upstream through Wells Dam on 30 Jun 2008. Entered the Methow R. on 1 Jul 2008. Fish 412 successfully made **two upstream** and **one downstream** passage through Wells Dam during its detection history.

Fish 418 (code 14-180)

Released 31 May 2006 in Columbia R. at Rocky Reach Dam. Entered the WPA at the gateway station on 2 Jun, and approached Wells Dam on 3 Jun 2006. Passed upstream through Wells Dam on 4 Jun 2006. Entered Methow R. 7 Jun, and exited after 15 Nov 2006. Passed downstream through Wells Dam undetected between 18 Feb and 13 Mar 2007, and exited the WPA at the gateway station between 22 Mar and 1 Apr 2007. Re-entered the WPA on 3 Jun, and approached Wells Dam 4 Jun 2007. Began ascent of Wells Dam, recaptured at the adult trap, and released upstream on 18 Jun 2007. Entered the Methow R. on 20 Jun, and exited on 29 Jun. Last detected in Wells Dam Forebay 29 Jun 2007. Fish 418 successfully made **two upstream** passages and **one downstream** passage through Wells Dam during its detection history.

Fish 422 (code 14-184)

Released 5 Jun 2006 in Columbia R. at Rocky Reach Dam. Entered the WPA and approached Wells Dam on 10 Jun 2006. Passed upstream through Wells Dam on 19 Jun 2006. Entered Methow R. 19 Jun, and exited on 11 Dec 2006. Passed downstream through Wells Dam before 3 Jul 2007. Passed upstream through Wells Dam on 8 Jul 2007. Entered Methow R. 9 Jul; exited the Methow R. 2 Nov 2007 and remained in the vicinity through 29 Mar 2008. Passed downstream through Wells Dam on 16 May 2008. Passed upstream through Wells Dam on 27

May 2008. Entered the Methow R. on 28 May 2008, and last seen at the same. Fish 422 successfully made **three upstream** passages and **two downstream** passages through Wells Dam during its detection history.

Fish 426 (code 14-188)

Released 22 Jun 2006 in Columbia R. at Rocky Reach Dam. Approached Wells Dam on 26 Jun, and passed upstream through Wells Dam on 1 Jul 2006. Entered Methow R. on 2 Jul, and exited on 31 Oct 2006. Passed downstream through Wells Dam between 31 Oct and 20 Dec 2006 and moved downstream of the WPA near the Entiat R. Re-entered the WPA at the gateway station on 13 Jun, and approached Wells Dam 14 Jun 2007. Passed upstream through Wells Dam on 19 Jun 2007. Entered Methow R. 19 Jun, and last detected in Methow R. on 20 Nov 2007. Fish 426 successfully made **two upstream** passages and **one downstream** passage through Wells Dam during its detection history.

Fish 428 (code 14-190)

Released 29 Jun 2006 in Columbia R. at Rocky Reach Dam. Entered the WPA at the gateway station on 1 Jul, and approached Wells Dam on 2 Jul. Moved downstream of the WPA near the Entiat R. after 24 Sep 2006. Re-entered the WPA at the gateway station on 9 Jun 2007. Passed upstream through Wells Dam on 10 Jun 2007. Entered the Okanogan R. several times between 11 and 15 Jun 2007. Entered Methow R. on 16 Jun, and later detected in Twisp R. between 11 Jul and 1 Nov 2007 (last detection). Fish 428 successfully made **one upstream** passage through Wells Dam during its detection history.

Fish 503 (code 14-3)

Released 30 May 2005 in Columbia R. at Rocky Reach Dam. Approached Wells Dam on 12 Jun. Passed upstream through Wells Dam on 17 Jun 2005. Entered Methow R. on 29 Jun 2005, and exited after 19 Oct 2006. Detected in Wells forebay on 26 Oct 2006, and re-entered Methow R. before 16 Nov 2006. Detected in Methow R. through 1 Oct 2007 and last seen in Methow R. on 10 Apr 2008. Fish 503 successfully made **one upstream** passage through Wells Dam during its detection history.

Fish 531 (code 14-31)

Released 31 May 2005 in Columbia R. at Rocky Reach Dam. Approached Wells Dam on 5 Jun 2005. Passed upstream through Wells Dam on 25 Jun 2005. Entered Methow R. 27 Jun 2005, and exited on 29 May 2006. Passed downstream through Wells Dam undetected between 29 May and 29 Jun 2006 when it was detected in the Columbia R. downstream of the WPA. Detected in the Wenatchee R. between 19 Sep 2006 and 2 Nov 2007, and in the Columbia R. below the Entiat R. confluence 30 Nov 2006 through 11 Jan 2007. Detected again in the Wenatchee R. 9 Jul 2007. Tag recovered downstream of the WPA 5 Sep 2007. Fish 531 successfully made **one upstream** and **one downstream** passage through Wells Dam during its detection history.

#### Fish 544 (code 14-44)

Released 27 Jun 2005 in Columbia R. at Rocky Reach Dam. Entered the WPA at gateway station on 29 Jun, and approached Wells Dam on 30 Jun 2005. Remained in the vicinity through 25 Oct 2005 when it exited the WPA. Re-entered the WPA 5 May 2006 and passed upstream through Wells Dam on 23 May 2006. Entered the Methow R. 24 May 2006. Exited Methow R. 9 Nov 2006. Passed downstream through Wells Dam 16 Nov 2006. Exited the WPA on 18 Nov 2006 and later detected in the Entiat R. between 20 Dec 2006 and 3 Apr 2007. Last detected at Wells Gateway Station 25 Aug 2007. Fish 544 successfully made *one upstream* and *one downstream* passage through Wells Dam during its detection history.

### **The summary of detection histories for bull trout tagged by USFWS that made up- or down-stream passages through Wells Dam are as follows:**

#### Fish 204 (code 1-74)

Released 12 Apr 2006 in Methow R. Exited the Methow R. 17 Jul 2006. Passed downstream through Wells Dam 19 Jul 2006, and detected moving around the tailrace through 14 Aug 2006. For a period of approximately one week, it was detected in the right tailrace (possibly the Wells hatchery outfall where bull trout have been observed before). It was then detected in the left tailrace from 25 Jul to 26 Jul before disappearing from detection for 3 days, and then reappearing on 29 Jul. This pattern of detection/no detection/detection occurred 3 more times from 30 Jul to 2 Aug, 2 Aug to 9 Aug, and 14 Aug to 18 Aug and suggests that the fish was moving in and out of detection zones. On 18 Aug, the tag began emitting the mortality signal consistently with a stable maximum power. Given the tag detection history, the immense fishing pressure that was occurring in the Wells Dam tailrace, and the condition of the recovered tag (without any trace of fish), the most likely scenario is that this bull trout was caught by anglers and the tag thrown into the nearshore area. The tag was recovered 19 Sep 2006 on the right bank approximately 1 mile downstream of Wells Dam. The tag was clean and found in large cobble substrate in what is likely several feet of water when the Rocky Reach pool is up. Documented in an email from Bao Le to Steve Lewis, 19 Sep 2006. Fish 204 successfully made *one downstream* passage through Wells Dam during its detection history.

#### Fish 300 (code 1-83)

Released 20 Jun 2007 in Chewuch River. Exited the Methow R. and passed downstream through Wells Dam 5 Jul 2007. Last detected on 6 Jul 2007 downstream of the WPA. Fish 300 successfully made *one downstream* passage through Wells Dam during its detection history.

## **Appendix B**

### **Comments from U.S. Fish and Wildlife Service Mid-Columbia Relicensing Coordinator**

## **RESPONSE FROM DOUGLAS PUD TO THE USFWS REGARDING THE USFWS' COMMENTS ON THE BULL TROUT MONITORING REPORT**

-----Original Message-----

From: Josh Murauskas  
Sent: Tuesday, December 23, 2008 9:18 AM  
To: 'Stephen\_Lewis@fws.gov'  
Cc: Shane Bickford  
Subject: RE: Draft Wells Bull Trout Management Plan (USFWS Comments)

Steve -

I just wanted to touch base again and let you know that Shane and I have discussed your comments and they'll be addressed in our final report to FERC.

Travel safely and enjoy the holiday!

Josh

Joshua Murauskas, Sr. Aquatic Resource Biologist Public Utility District No. 1 of Douglas County  
1151 Valley Mall Parkway East Wenatchee, WA 98802  
509.881.2323 (v) 509.884.0553 (f)

## **COMMENTS FROM THE USFWS REGARDING DOUGLAS PUD'S DRAFT BULL TROUT MONITORING REPORT**

-----Original Message-----

From: Stephen\_Lewis@fws.gov [mailto:Stephen\_Lewis@fws.gov]  
Sent: Monday, December 22, 2008 5:50 PM  
To: Josh Murauskas  
Cc: Shane Bickford  
Subject: Draft Wells Bull Trout Management Plan (USFWS Comments)

Josh/Shane-

Thanks for sharing this draft with us. I do have a few comments for your consideration:

Executive Summary: Based upon my quick tally, I ended up with 41 events as well. Plus, I would frame the context of the entire study for eight years depending on how you divide the monitoring versus tagging components

The report would benefit from a breakdown of how downstream adult/sub-adult passage events are characterized. For example, is there a specific affinity for individuals to pass through specific slots?? This would greatly assist in the section 7 process.

With regard to the conclusions, I agree that the data appears to suggest minimal effect to tagged individuals. However, as you know, USFWS will be assessing the effects of relicensing the Wells Project in the context of ESA Section 7 where the assessment of effects is finer-scale in nature. I suggest you include the following sentence at the end of the conclusions section: "The Service will be assessing the effect of relicensing the project on bull trout within the context of ESA section 7 analysis."

Thanks for divulging the multivariate analysis, interesting stuff, a bit surprising to find a lack of correlation(s)...

S-

Stephen T. Lewis  
Mid-Columbia Relicensing Coordinator  
U.S. Fish and Wildlife Service  
Central Washington Field Office  
215 Melody Lane, Suite 119  
Wenatchee, WA 98801  
phone: (509) 665-3508 Ext. 14  
fax: (509) 665-3523  
e-mail: [Stephen\\_Lewis@fws.gov](mailto:Stephen_Lewis@fws.gov)

## **REQUEST FROM DOUGLAS PUD TO USFWS TO REVIEW THE DRAFT BULL TROUT MONITORING REPORT**

"Josh Murauskas" [joshm@dcpud.org](mailto:joshm@dcpud.org)  
To <[Stephen\\_Lewis@fws.gov](mailto:Stephen_Lewis@fws.gov)>  
12/15/2008 03:48 PM  
cc "Shane Bickford" <[ShaneB@dcpud.org](mailto:ShaneB@dcpud.org)>

Steve –

Please find the attached 3-year report for bull trout at the Wells Project for your review.

Please contact us should you have any questions.

Thanks,

Josh

Joshua Murauskas, Sr. Aquatic Resource Biologist Public Utility District No. 1 of Douglas County  
1151 Valley Mall Parkway East Wenatchee, WA 98802  
509.881.2323 (v) 509.884.0553 (f)  
(See attached file: Wells BT 2005-2008 Draft Report.doc)