

ANNUAL REPORT OF OPERATIONS

FISH FACILITIES: 2010

Public Utility District No. 1 of Douglas County  
1151 Valley Mall Parkway  
East Wenatchee, Washington  
98802-4497

Wells Hydroelectric Project  
F.E.R.C. Project No. 2149

March 2011



# FISH FACILITIES OPERATIONS ANNUAL REPORT FOR 2010

## WELLS HYDROELECTRIC PROJECT NO. 2149

Located on the Columbia River at River Mile 515.6

### I. FISH COUNT AND RIVER CONDITIONS

A. Enumeration of adult salmon and steelhead using fish ladders at Wells Dam began on May 1 and continued through November 15. Counting was accomplished by reviewing digital video records of fish passing ladder windows. Monthly counts of each species for 24-hour and 16-hour count periods in 2010 are included in Tables 1 and 2, respectively. Table 3 shows the nighttime percent of total passage of adult salmon and steelhead. Adult steelhead, and spring and summer Chinook, and coho salmon were removed from the ladders for broodstock and are not included in the count summaries of Tables 1 and 2, but are listed in Table 4. Attachment A shows the 24-hour fish passage (0000-2400 PST) at Wells Dam by species by day from May 1 through November 15th. Attachment B shows the annual ladder counts of salmon and steelhead (16-hour count) at Wells Dam from 1967 through 2010. For comparison, Attachment C shows the 24-hour count totals for the years 1998 through 2010 (24-hour counts commenced in 1998).

B. Bull trout (*Salvelinus confluentus*) passage records were first initiated at Wells Dam in 1999. In 2010, 44 migratory-sized bull trout were counted between May 1 and November 15 (see Attachment A). Starting in the winter of 2004-2005, Public Utility District No. 1 of Douglas County (Douglas PUD), following a request from the U.S Fish and Wildlife Service (USFWS), has also been conducting winter bull trout counts (November 16 – April 30). During the past six years of winter bull trout counting, no bull trout have been observed using the fish ladders at Wells Dam.

C. Adult lamprey (*Lampetra tridentata*) passage records were first initiated at Wells Dam in 1995. Lamprey counts were recorded from May 1 through November 15, 2010, and two lamprey were counted during that period. Daily passage numbers are shown in (see Attachment A).

### II. PROJECT OPERATIONS

#### A. Adult Fish Passage Facilities

The adult fish passage facilities were operated using the criteria documented in the Wells Habitat Conservation Plan (HCP), and in cooperation with the Fisheries Agencies and Tribes (See HCP Section 15, Appendix A: Adult Fish Passage Plan). Information from several years of radio-telemetry studies with both salmon and steelhead at Wells Dam showed that fishway passage time was reduced by closing the side entrance at both east and west fishways. Based upon approval of the Joint Fisheries Parties, who serve on the Wells HCP Coordinating Committee, a decision was made in 2001 to change the fishway-operation criteria at Wells Dam including the closure of the side entrance on each ladder and increasing the opening of the end gates from a six-foot opening to an eight-foot opening.

Routine inspection and maintenance was performed on the west fishway from January 14 through February 3, 2010 (inspection and bi-annual maintenance) and the 16<sup>th</sup> through the 29<sup>th</sup> of December 2010 (inspection and annual maintenance), and on the east fishway from December 22, 2009 through January 5, 2010 (inspection and annual maintenance). Both fishways operated at criteria throughout the fish passage assessment period, except on July 21, auxiliary water supply flow to both fishways was turned off (one fishway at a time) to install DIDSON cameras at both fishway entrances for a study of lamprey entrance efficiency that was approved by the HCP Coordination Committee.

## **B. Juvenile Bypass Facilities**

The juvenile bypass facilities at Wells Dam are designed to attract downstream-migrating fish to surface passage through spill bays instead of through deep-water turbine intakes. The hydrocombine design of Wells Dam incorporates the spillway and powerhouse components of the dam into a single 1,130-foot-long section, where all flow through the dam must pass. Five spill bays (numbers 2, 4, 6, 8 and 10), located above paired turbine intakes, are equipped with bypass flow barriers and baffles. Because of the hydrocombine design, flow through the turbine intakes attracts juvenile salmonid migrants to the bypass facilities, where they are further attracted by water velocities at slotted bypass baffles and pass the project with a small volume of bypass spill.

Based upon the approval of the HCP Coordinating Committee, the spring bypass season started on April 12<sup>th</sup> at 0000 hours and ran continuously through June 13<sup>th</sup> at 2400 hours. Spring bypass operations utilized a total volume of 943 thousand acre-feet (KAF), or 7.0 percent of total project discharge volume.

Based upon the approval of the HCP Coordinating Committee, summer bypass operations began on June 14<sup>th</sup> at 0000 hours and ran until August 26<sup>th</sup> at 2400 hours, for a total of 74 days. Summer bypass operations utilized 1,156.5 KAF, or 6.2 percent of the total discharge volume.

The initiation and termination of the Wells bypass in 2010 was guided by the Wells HCP Coordinating Committee. Operation of the bypass system was strictly guided by the Bypass Operating Plan contained within Section 4.3 of the Wells HCP Agreement. The initiation and termination dates for the bypass system in 2010 were based upon 21 years of hydroacoustic and 14 years of species composition information collected on run patterns of juvenile hatchery and wild salmonids at Wells Dam. Based upon an analysis of the run-timing information at Wells Dam, the HCP Coordinating Committee agreed to initiate the Wells bypass system on April 12<sup>th</sup>. The analysis indicated that on average initiating the bypass system on April 12<sup>th</sup> would provide a non-turbine passage alternative for 95.5 percent of the spring emigrants. Similarly, shutting down the bypass system on August 26<sup>th</sup>, on average would provide bypass operation for 95 percent of the summer emigrants.

### **III. WATER QUALITY**

#### **A. Temperature Monitoring at Wells Dam**

Daily water temperature and total dissolved gas readings from April through September, 2010, are provided in Attachment D. Historically, water-temperature data were collected at the turbine cooling-water intake at Unit 5. A comparative analysis of water temperature data collected from the cooling-water intake and data collected in the Wells forebay and tailrace indicated that the historical water temperature sampling site (cooling water pipe) was recording temperatures several degrees Fahrenheit higher than river water temperatures collected at the two in-water monitoring stations. Since 2003, water temperatures have been measured at the intake for the fish-ladder attraction-flow pumps located in the tailrace of Wells Dam.

#### **B. Total Dissolved Gas Monitoring at Wells Dam**

The Wells Project was operated in 2010 according to the 2010 Wells Hydroelectric Project Gas Abatement Plan (GAP) that was a modified version of the original GAP developed in 2009. The 2009 GAP, which was approved by the Washington State Department of Ecology (Ecology) on February 28<sup>th</sup>, 2009, described operational measures intended to meet state water quality standards for TDG.

The Wells Project 2009 GAP introduced the latest numerical model developed by the University of Iowa's IIHR-Hydroscience and Engineering Hydraulic Research Laboratories. The two-phase flow computational fluid dynamics tool was used to predict hydrodynamics of TDG distribution within the tailrace of Wells Dam and further identify operational configurations that would minimize TDG production at the project. In an April 2009 report, the model demonstrated that Wells Dam can be operated to meet the TDG fish-spill waiver standards during the passage season with flows up to "7Q-10 levels" (246,000 cfs). Engineers determined that the most benign spillway operation at the Wells Project was the use of a concentrated spill pattern through Spillbay No. 7 and surplus flow volume through other spillbays in a defined pattern. These preferred TDG operating conditions create surface-oriented flows by engaging submerged spillway lips below the ogee, thus increasing degasification at the tailrace surface, decreasing supersaturation at depth, and preventing high-TDG waters from bank attachment. These principles were the basis of the 2009 Wells Project Spill Playbook and were fully implemented for the first time during the 2009 fish passage (spill) season as part of the GAP. The 2010 GAP and Spill Playbook was approved by Ecology on April 9, 2010 and amended on July 1, 2010.

Although the 2010 water year was characterized as having a below average snow pack, it was unique runoff season that had a relatively short high-water event in June due a set of unusual storm events that caused high run-off conditions throughout the Columbia River basin. Coupled with variable wind generation and its impacts on FCRPS operational flexibility and low electricity demand due to cool weather, relatively higher levels of involuntary spills occurred at projects upstream of Wells Dam. This resulted in abnormally high forebay TDG values at Wells Dam and resulted in a number of observed exceedances of the 125% hourly and 12C-High daily values both in the Wells Dam tailrace and Rocky Reach forebay. In response to the June exceedances, Douglas PUD amended the GAP and implemented in-season changes to its spill

operations at the project resulting in improved TDG performance with no observed exceedances of the tailrace TDG criteria after the changes were implemented on July 1<sup>st</sup>.

At Wells Dam, river flows in June were approximately 4% higher than the 16-year average, and June was the only month in 2010 where monthly flows were greater than the 16-year average. During the latter half of June and early July, incoming flows to Wells Dam were often above 200 kcfs and on nine occasions, hourly flows exceeded the 7Q-10 value of 246 kcfs. Incoming TDG levels during this time period consistently ranged between 110-114% as Chief Joseph Dam spilled higher volumes of water. The outage of Turbine Unit 7 for generator rebuild at Wells Dam reduced generating capacity thereby increasing the need to spill. Outage of Unit 7 likely also contributed to higher TDG by not supporting the surface jet for spill discharged from spillbay 7. These factors, combined with minimal load requirements, high flow volumes and relatively high incoming TDG resulted in three exceedances of the 125% hourly criterion and four exceedances of the 12C-High 120% criterion in the Wells Dam tailrace, and eight exceedances of the 12C-High 115% criterion in the Rocky Reach Forebay despite implementation of the Spill Playbook.

In response to the observed exceedances, Douglas PUD implemented in-season changes to the 2010 Spill Playbook. Specifically, the amended Spill Playbook stated that when spill levels are expected to reach the 53 kcfs threshold, the Juvenile Bypass System barriers in spillbay 6 should be removed in order to remain in compliance with the TDG criteria in the Wells Dam tailrace and Rocky Reach Dam forebay (the previous threshold for removal was 96 kcfs). After July 1<sup>st</sup>, when spill approached the 53 kcfs criteria, the bypass barriers were removed and the excess spill was directed through spillbays 6 and 7 rather than through spillbays 5 and 7, compacting the spill pattern to reduce the surface area of the air-water interface between spillbay flows and the subsequent potential for lateral mixing and air entrainment. After implementation of the modified spill playbook on July 1<sup>st</sup>, eight additional events of high incoming TDG were observed (>113%) at Wells Dam with incoming TDG regularly exceeding 110%, yet no exceedances occurred in the Wells Dam tailrace or the Rocky Reach forebay, confirming the efficacy of the operational changes.

Total Dissolved Gas (TDG) data are reported for both the forebay and tailwater as the 12-hour high continuous average (12C-High) in percent TDG (see Attachment D)

#### **IV. FISH PRODUCTION**

The Washington Department of Fish and Wildlife (WDFW) manages the commercial, sport, and non-game fish and wildlife resources of the State of Washington. The Wells and Methow hatcheries are owned and funded by Douglas PUD, and operated by WDFW, and WDFW personnel provided the information on summer/fall Chinook and steelhead production at the Wells Hatchery (Table 5) and spring Chinook production at the Methow Hatchery (Table 6) through 2010.

## **V. FISH STUDIES AND PROGRAMS**

Douglas PUD funded several fish-related studies and programs during 2010. A summary of each follows.

### **A. Wells 2010 Survival Verification Study**

In the spring of 2010, Douglas PUD conducted the Wells HCP required 10-year Survival Verification Study (SVS) at the Wells Project. The Wells HCP Coordinating Committee selected yearling summer Chinook to represent juvenile yearling Chinook and steelhead for the 2010 study.

The primary goal of the study was to precisely estimate the survival of PIT-tagged yearling Chinook migrating through the Wells Project. Fish were released at three locations: above Wells Dam at the mouths of the Okanogan (Rkm 870) and Methow (Rkm 843) rivers and below Wells Dam, into the tailrace (Rkm 829.6). Chinook released at the mouths of the Okanogan and Methow rivers were pooled into one “reservoir” release group in an effort to mimic the proportional contribution of the two rivers to the overall spring smolt migration passing through the Project.

A total of 77,155 PIT-tagged Chinook were released during this study during the months of April and May. Fish were released during fifteen replicate releases at each of the three specified release locations for a total of 45 releases. Each replicate release group at each of the three release sites was provided nearly identical rearing, collection, tagging, recovery, interrogations, and transportation exposures, to prevent unnecessary covariates in experimental methods and analyses.

Passive interrogation of study fish occurred at the PIT-tag detection systems installed at Rocky Reach, McNary, John Day, and Bonneville dams. Additionally, study fish were detected in the Columbia River estuary by a boat-towed PIT-tag trawl.

Survival through the Wells Project (reservoir, forebay, dam and tailrace) was estimated based upon the relative survival of treatment (Okanogan and Methow) and control (tailrace) release groups. The weighted average survival for yearling Chinook passing from river mouths to a point 300 m downstream of Wells Dam  $\hat{=}$  0.964 (SE= 0.0128) during 2010. The survival estimate generated for Chinook in 2010 was not significantly different from the average three-year survival estimate 0.962.

The results of the 2010 study confirmed that the Wells Project continues to achieve a high rate of survival for yearling Chinook and steelhead, even during the second lowest flow year in the past 25 years. The 4-year average estimate of survival used to determine the No Net Impact hatchery compensation levels has increased as a result of this study. The 3-year average mitigation goal was 3.8 percent based upon the 3-year average survival of 96.2 percent. The 4-year average survival used for determining the No Net Impact calculation is now 96.3 percent, with an associated hatchery compensation goal of 3.7 percent for yearling Chinook, steelhead and coho.

## **B. Sockeye Salmon Enhancement**

At the end of 2001, the Wells HCP Coordinating Committee agreed to shift the focus of Douglas PUD's sockeye responsibility from an experimental sockeye hatchery program located at Cassimer Bar to a water-management planning tool for the Canadian Okanagan River. Seasonal patterns of water releases from Okanagan Lake were found to adversely affect the production of both sockeye and kokanee. Douglas PUD worked with the Canadian fisheries parties to develop a model-based flow-management program for use as a decision-making tool by river managers for preventing or minimizing losses to sockeye and kokanee production. The Fish Water Management Tool (FWMT) is the model developed to allow both fish and water managers, collectively, to determine how releases of water would affect kokanee and sockeye resources, flood control, water-dependent recreation, and irrigators. During 2003, considerable effort was spent on the development of the FWMT and the estimation of physical and biological model parameters.

To determine if the FWMT model could improve water-release practices, retrospective analyses were performed during 2004 using historical monthly records collected over the previous twenty-five water years. The retrospective analyses indicated that the annual improvement in salmon egg-to-emergence survival from the implementation of the FWMT was on average 55 percent. According to the model, estimated smolt savings from using the FWMT were better in a wet year (75 percent) rather than a dry year (38 percent) because of the avoidance of egg scour. The best results from the FWMT retrospective analyses demonstrated a 443 percent improvement in salmon survival during one historic water year. In all years the FWMT provided greater than the 7 percent required mitigation for juvenile sockeye losses at Wells Dam. On October 5, 2004, the Parties to the Wells HCP via the Hatchery Committee approved the FWMT program as fulfilling Douglas PUD's sockeye hatchery mitigation responsibility for unavoidable losses of juvenile sockeye at Wells Dam.

2010 was the sixth year that the FWMT was used by Canadian fisheries and water managers to guide water-release decisions for the Canadian Okanagan River. Despite atypical climatic and hydrologic conditions experienced during the first six years of implementation, the Operational Team has managed river flows and lake levels with the FWMT in a manner that effectively minimized property damage and fisheries losses. The real-time performance of the FWMT has consistently exceeded expectations based upon the retrospective analyses performed in 2004.

## **C. Adult Fishway PIT-Tag Detection System**

The National Marine Fisheries Service's (NMFS) 2000 Biological Opinion required that Douglas PUD install adult PIT-tag detectors in the two adult fishways at Wells Dam. A PIT-tag detection system was installed in the winter of 2001-2002 and began collecting data during the 2002 adult migration. Analysis from tests of system performance indicated a detection efficiency of 99.9 percent.

Because the adult traps in each fishway are below the PIT-tag detection system, PIT-tagged fish diverted from the fishway at each trap were not monitored by the PIT-tag detection system. To increase the coverage of the system, additional PIT-tag detectors were installed in 2004 on the exit of each east and west fishway traps; the system on the trap on the west fishway was upgraded in 2008 to increase detection efficiency.

#### **D. Northern Pikeminnow Removal in the Wells Tailrace and Reservoir**

Northern pikeminnow (*Ptychocheilus oregonensis*) are a major predator of juvenile salmonids in the Columbia Basin. As required by the Wells HCP, Douglas PUD continued the implementation of a program for removal of and data collection on northern pikeminnow from the Wells Project (tailrace and reservoir) in 2010. The pikeminnow-removal contractor used set-line gear to capture 19,082 northern pikeminnow in 2010. Of that total, 16,851 were at least 9 inches in fork length and 2,231 were less than 9 inches in fork length. These fish were captured during 4,618 hours of angling effort translating into an overall catch-per-unit-effort (CPUE) or fish-per-hour value of 4.3. Angling effort was determined by total hours spent to pull, check, and reset lines as well as travel and preparation time (tying hooks, assembling lines, etc.). More fish were captured in the Wells Reservoir, which includes the lower 1-mile section of the Methow River (9,814), than in Wells tailrace (9,268). From 1995 through 2010, the pikeminnow removal programs sponsored by Douglas PUD have resulted in the removal of approximately 212,000 pikeminnow from the Wells Project.

#### **E. Lamprey Passage Study**

Douglas PUD conducted studies in 2009 and 2010 to investigate adult Pacific lamprey passage at Wells Dam. The studies assessed the effects of velocity reductions at fishway entrances on the attraction of adult lamprey to those entrances and their relative entrance success. During the fall of 2009, three entrance velocities (i.e., existing high, medium, and low) were assessed using Dual-frequency Identification Sonar (DIDSON) in a randomized-block design with the goal of identifying optimal hydraulic conditions conducive to attraction to and entry of adult lamprey into the fishways at Wells Dam. The study was repeated in 2010 using only the 1.5-foot and 1-foot differentials; results are pending.

Velocities at the fishway entrances were modulated by adjusting the water-surface elevations in the collection galleries relative to the tailrace water-surface elevation (referred to as the “head differential”); the normal operating head differential for the Wells fishway entrances is 1.5 feet. The HCP Coordinating Committee approved both the 2009 and 2010 velocity adjustments, concluding that the studies would not interfere with passage by adult salmonids (HCP Plan Species), and would provide valuable information regarding the behavior of lamprey at the fishway entrances. Results from the 2009 study demonstrated that a 1-foot head differential produced the most favorable velocities at the fishway entrances for lamprey attraction and entrance success. The 2010 study similarly demonstrated that a 1 foot differential is preferred by lamprey relative to a 1.5 foot differential. Salmonid entrance to the fishways was unaffected by the reduction in head differential from 1.5 feet to 1 foot.

#### **F. Measurement of Fishway Entrance Velocities**

In June of 2010 the HCP Coordinating Committee requested that Douglas PUD conduct water velocity mapping at the entrances to the fishways at Wells Dam under the entrance conditions tested in the lamprey passage studies. The product velocity maps would identify whether entrance velocities were adequate for salmonid attraction and whether sufficient variation in velocities existed within the entrances so that lower velocity conditions were available for exploitation by lamprey.

Douglas PUD implemented a proposal from Northwest Hydraulic Consultants to measure

fishway entrance velocities using Acoustic Doppler Velocimeters (ADV). Douglas PUD constructed a trolley frame to position the ADVs in the fishway entrance. The trolley frame was completed in December of 2010, and ADV measurements were conducted in March of 2011. A draft report of the test results is currently under review by Douglas PUD and will be presented to the HCP Coordinating Committee in June of July of 2011.

### **G. Bull Trout Monitoring and Management Plan**

During 2010, Douglas PUD continued to implement the Wells Bull Trout Monitoring and Management Plan (Bull Trout Plan) based upon the plan approved by the USFWS and the Federal Energy Regulatory Commission (FERC) in 2005. 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 (*Salvelinus confluentus*) associated with the operations of the Wells Hydroelectric Project and associated facilities (Douglas PUD 2004). The Bull Trout Plan was prepared and implemented to meet monitoring requirements stipulated in a USFWS Biological Opinion regarding implementation of the Wells HCP. The USFWS Biological Opinion monitoring requirements were also incorporated by the FERC into the existing Wells Project license in 2004. The Bull Trout Plan was developed in collaboration with the USFWS, NMFS, WDFW, the Colville Confederated Tribes, and the Yakama Nation, and was approved by the FERC.

The first objective of the Bull Trout Plan 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 of each bull trout being tagged and released. During the six-year study and eight years of monitoring, 19 downstream and 79 upstream passage events occurred 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, no 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, no 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, and 24 percent (52) were radio-tagged.

Project operations did not appear to influence the movements of adult bull trout. Instead, passage events by adult bull trout appeared 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.

Forty-four bull trout were counted in the fishways at Wells Dam during 2010, and 82% of those observations were in the May-June period, with the last observation in late October 2010. This timing is consistent with past years, and indicates bull trout passage at the dam is a seasonal trend independent of Project operations. Since winter counts were initiated in 2005, no adult bull trout have been observed during the off-season fishway counting period (November 16 to April 30).

No upstream or downstream passage problems have been identified, either during the 2005-2008 telemetry studies, or subsequent passive monitoring efforts. 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 of the Bull Trout Plan 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 July 2008, 67 sub-adult bull trout were PIT-tagged in the Methow River sub-basin during standard tributary smolt-trapping operations. From August 2008 to December 2009, 41 sub-adult bull trout were PIT-tagged at screw traps or hook-and-line remote sampling within the Methow Basin. WDFW personnel captured and PIT tagged 18 adult bull trout while hook-and-line sampling for residual steelhead in the Methow Basin from Dec 2009 to Jan 2011. Ninety-one adult bull trout were captured at the Twisp River weir in 2010 (length range 44-79 cm), 87 of which were subsequently PIT tagged and released back into the Twisp River upstream of the Twisp Weir (the other four adult bull trout had been previously PIT-tagged). Douglas PUD operated PIT-tag detection systems year-round within the Wells Dam fishways during the study period (2005 to the present) and no PIT-tagged sub-adult bull trout have been detected. Additionally, sub-adult bull trout were to be PIT-tagged opportunistically when encountered at the Wells Project; however, to date no sub-adult bull trout have been encountered at Wells Dam.

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. Additionally, no sub-adult bull trout have been observed utilizing the fishways at Wells Dam during the winters of 2006 through 2010.

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, 2007, 2009, or 2010 because river operations were not low enough to warrant a survey.

The fourth objective of the Bull Trout Plan 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 along 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 percent Methow River, 10 percent Entiat River, and 2 percent Wenatchee River. Genetic samples of all fish tagged at Wells Dam were submitted to the USFWS for analysis.

In summary, since monitoring began in 2001, no mortality or injury has observed for bull trout passing through the Wells Project. No incidental take of bull trout has been 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).

**VI. EXPENSES for the 2010 Calendar Year**

**A. Fish Passage and Production Facilities and Non-study Expenses**

	Total Costs	Minus Credits <sup>1</sup>
1. Operation of District Wells Hatchery a/c 537.2, 545.34	\$1,390,241	\$1,277,241
2. Supervision of Fish & Game Facilities a/c 537.3	\$326,032	\$326,032
3. Operation of District Methow Hatchery a/c 537.7, 545.5	\$969,827	\$141,897
4. Fish Management a/c 537.9, 545.8	\$799,674	\$799,674
5. Maintenance of District Fish Facilities a/c 545.2	\$66,005	\$66,005
6. Maintenance Miscellaneous Fish Related a/c 545.6	\$1,916	\$1,916
7. Annual Debt Service on Fish and Game Plant	\$3,828,764	\$3,828,764
Totals	\$7,382,762	\$6,441,529

<sup>1</sup>Actual costs to Douglas PUC calculated according to the terms of existing hatchery sharing agreements

**B. Licensee Fisheries Study Costs**

1. Fish Studies a/c 537.5	\$1,965,880
2. Fish Studies – Methow a/c 537.6	\$691,391
Total	\$2,657,271

**Table 1.** 2010 Wells Dam fish counts (24-hour count period) summarized by month.

Month	Chinook Salmon				Coho	Sockeye	Steelhead		Total			
	Spring		Summer				Fall			All		
	Adults	Jacks	Adults	Jacks	Adults	Jacks	A+J	Hatchery	Wild			
May	6,428	459					6,887	18	77	95		
June	1,168	202	306	12			1,688		3,565	9	25	34
July			21,403	797			22,200		285,390	612	473	1,085
August			5,343	1,089	160	239	6,831		2,766	2,539	1,985	4,524
September					2,032	615	2,647	109	34	3,152	2,083	5,235
October					819	244	1,063	876	11	916	665	1,581
November					135	12	147	249		179	196	375
<b>Totals</b>	<b>7,596</b>	<b>661</b>	<b>27,052</b>	<b>1,898</b>	<b>3,146</b>	<b>1,110</b>	<b>41,463</b>	<b>1,234</b>	<b>291,766</b>	<b>7,425</b>	<b>5,504</b>	<b>12,929</b>
<b>Totals A+J</b>	<b>8,257</b>		<b>28,950</b>		<b>4,256</b>							

Chinook counted per WDFW conversion dates: Spring Chinook May 1 - June 28; Summer Chinook June 29 - August 28; Fall Chinook August 29 - November 15

**Table 2.** 2010 Wells Dam fish counts (16 hour count period [0400 - 2000 PST]) summarized by month.

Month	Chinook Salmon							Coho	Sockeye	Steelhead	
	Spring		Summer		Fall		All			Hatchery	Wild
	Adults	Jacks	Adults	Jacks	Adults	Jacks	A+J				
May	6,256	445					6,701			17	70
June	1,092	192	193	3			1,480		3,133	8	21
July			20,749	778			21,527		24,9554	582	442
August			4,816	923	148	208	6,095		2,356	2,367	1,894
September					1,870	490	2,360	98	30	2,793	1,816
October					703	221	924	722	10	807	574
November					118	7	125	176		146	159
Total	7,348	637	25,758	1,704	2,839	926	39,212	996	255,083	6,720	4,976
Totals A+J	7,985		27,462		3,765						

**Table 3.** 2009 Wells Dam fish counts summarized by percentage of night passage (% observed between 000 - 0400 and 2000 – 2400, PST)

Month	Chinook Salmon							Coho	Sockeye	Steelhead	
	Spring		Summer		Fall		All			Hatchery	Wild
	Adults	Jacks	Adults	Jacks	Adults	Jacks	A+J				
May	3%	3%					3%			6%	9%
June	7%	5%	37%	75%			12%		12%	11%	16%
July			3%	2%			3%		13%	5%	7%
August			10%	15%	8%	13%	11%		15%	7%	5%
September					8%	20%	11%	10%	12%	11%	13%
October					14%	9%	13%	18%	9%	12%	14%
November					13%	42%	15%	29%		18%	19%
Total	3%	4%	5%	10%	10%	17%	5%	19%	13%	9%	10%

**Table 4.** Fish trapped from the ladders at Wells Dam and retained for broodstock and thus not included in the ladder counts in 2010.

Species	Chinook	Steelhead	Coho	Total
Number retained	593	367	254	571

**Table 5.** Production from the Wells Hatchery in 2010

	Summer Chinook	Summer Steelhead
Adults spawned in 2010	1,183	301 <sup>1</sup>
Eggs taken, 2010	2,268,280	719,097
Eggs transferred, 2010	1,025,880	62,560 <sup>2</sup>
Eggs transferred for Lake Chelan release, 2010	170,200	NA
Juveniles transferred (Ringold FH)	NA	166,337 <sup>3</sup>
Juveniles released, 2008 brood	336,881	NA
Juveniles released, 2009 brood	471,286	394,417

1. Adult steelhead collected at Wells Dam for broodstock are held until spawning during the following year. Steelhead spawned in 2010 (designated 2010 brood) were actually collected in 2009.
2. Transfer to the Winthrop National Fish Hatchery
3. Steelhead fry transferred to Ringold Hatchery.

**Table 6.** Spring Chinook production from the Methow Hatchery in 2010

	Twisp R.	Chewuch R.	Methow R.
Adults trapped, 2010 brood	89	272 <sup>1</sup>	
Adults spawned, 2010 brood	54	272	
Eggs taken, 2010 brood	108,000	544,000	
Juveniles released, 2008 brood	78,656	260,344	201,290 <sup>2</sup>

1. All non-Twisp fish were categorized as Methow-Composite (MetComp).
2. Methow River releases include 175,699 released directly from the Methow Hatchery in mid April, and 25,591 released to the Yakama Nation for acclimation in their Biddle Pond remote-acclimation site off of Wolf Creek, tributary to the Methow River upstream of the Methow Hatchery. The Yakama Nation reported no mortalities from that release group.

**Attachment A.** Wells Dam daily fish passage (24-hour count) for May 2010.

Date	Chinook		Coho	Sockeye	Steelhead		Lamprey	Bull Trout
	Adults	Jacks			Ad-clipped	Ad-present		
1	200	9	0	0	0	0	0	0
2	47	1	0	0	0	7	0	0
3	34	0	0	0	0	2	0	0
4	7	0	0	0	3	5	0	0
5	20	0	0	0	0	4	0	0
6	399	15	0	0	1	0	0	0
7	288	5	0	0	2	3	0	0
8	147	12	0	0	0	0	0	0
9	210	24	0	0	0	6	0	0
10	138	0	0	0	0	1	0	0
11	94	2	0	0	0	3	0	0
12	231	1	0	0	1	0	0	0
13	545	27	0	0	2	9	0	0
14	190	10	0	0	0	3	0	2
15	212	5	0	0	0	4	0	0
16	564	12	0	0	1	2	0	0
17	432	8	0	0	0	2	0	0
18	438	29	0	0	0	0	0	1
19	159	6	0	0	2	1	0	1
20	301	7	0	0	1	1	0	1
21	432	35	0	0	3	0	0	1
22	154	6	0	0	0	6	0	0
23	145	18	0	0	1	5	0	0
24	63	10	0	0	0	2	0	0
25	112	22	0	0	0	1	0	1
26	173	32	0	0	0	5	0	0
27	186	35	0	0	0	0	0	1
28	136	41	0	0	0	1	0	2
29	39	20	0	0	0	1	0	1
30	231	36	0	0	0	2	0	1
31	101	31	0	0	1	1	0	2
<b>Totals</b>	<b>6,428</b>	<b>459</b>	<b>0</b>	<b>0</b>	<b>18</b>	<b>77</b>	<b>0</b>	<b>14</b>

**Attachment A (continued).** Wells Dam daily fish passage (24-hour count) for June 2010.

Date	Chinook		Coho	Sockeye	Steelhead		Lamprey	Bull Trout
	Adults	Jacks			Ad-clipped	Ad-present		
1	27	14	0	0	1	2	0	2
2	52	24	0	0	0	0	0	1
3	27	12	0	0	0	0	0	2
4	140	21	0	0	1	0	0	0
5	17	9	0	0	-2	0	0	0
6	31	5	0	0	0	2	0	1
7	7	8	0	0	0	2	0	0
8	19	7	0	0	0	1	0	2
9	49	7	0	0	0	1	0	1
10	38	7	0	0	0	0	0	2
11	28	6	0	0	0	1	0	1
12	8	7	0	2	0	0	0	0
13	34	8	0	5	0	0	0	0
14	17	4	0	4	0	0	0	0
15	43	5	0	4	0	0	0	0
16	13	6	0	5	0	0	0	0
17	15	4	0	8	0	1	0	0
18	22	3	0	17	0	2	0	1
19	40	5	0	20	0	0	0	1
20	12	4	0	18	1	0	0	0
21	27	1	0	37	0	1	0	0
22	40	8	0	52	0	0	0	0
23	37	6	0	57	0	2	0	0
24	56	6	0	136	1	1	0	0
25	59	1	0	100	0	1	0	1
26	52	3	0	186	0	1	0	0
27	116	1	0	343	0	0	0	2
28	142	10	0	585	5	2	0	3
29	101	9	0	757	0	3	0	1
30	205	3	0	1,229	2	2	0	1
<b>Totals</b>	<b>1,474</b>	<b>214</b>	<b>0</b>	<b>3,565</b>	<b>9</b>	<b>25</b>	<b>0</b>	<b>22</b>

**Attachment A (continued).** Wells Dam daily fish passage (24-hour count) for July 2010.

Date	Chinook		Coho	Sockeye	Steelhead		Lamprey	Bull Trout
	Adults	Jacks			Ad-clipped	Ad-present		
1	212	10	0	1,532	1	3	0	0
2	185	9	0	2,532	1	3	0	0
3	791	22	0	6,366	0	4	0	0
4	548	19	0	13,341	8	6	0	0
5	598	10	0	14,945	7	3	0	0
6	601	8	0	18,276	0	3	0	0
7	1,192	4	0	22,577	10	2	0	0
8	1,149	28	0	22,989	10	12	0	1
9	1,075	33	0	19,902	6	10	0	0
10	953	72	0	19,416	11	11	0	2
11	1,115	22	0	20,463	12	13	0	0
12	921	11	0	20,331	8	10	0	1
13	865	36	0	15,247	18	8	0	0
14	1,112	19	0	11,345	18	24	0	1
15	641	18	0	9,980	12	10	0	0
16	497	24	0	8,298	19	13	0	1
17	1,208	69	0	8,654	28	20	0	0
18	777	13	0	6,840	10	8	0	0
19	443	26	0	7,718	25	22	0	0
20	935	79	0	3,018	27	19	0	0
21	1,044	31	0	9,915	46	20	0	0
22	701	36	0	4,844	15	17	0	0
23	1,221	34	0	3,687	32	3	0	0
24	468	2	0	3,436	33	28	0	0
25	372	13	0	2,271	27	31	0	0
26	222	7	0	1,861	25	20	1	0
27	454	21	0	1,413	47	29	0	0
28	153	28	0	908	23	12	0	0
29	247	24	0	1,310	44	25	0	0
30	538	45	0	1,069	55	40	0	0
31	165	24	0	906	34	44	0	0
<b>Totals</b>	<b>21,403</b>	<b>797</b>	<b>0</b>	<b>285,390</b>	<b>612</b>	<b>473</b>	<b>1</b>	<b>6</b>

**Attachment A (continued).** Wells Dam daily fish passage (24-hour count) for August 2010.

Date	Chinook		Coho	Sockeye	Steelhead		Lamprey	Bull Trout
	Adults	Jacks			Ad-clipped	Ad-present		
1	277	68	0	611	76	36	0	0
2	304	118	0	489	86	49	0	0
3	114	106	0	304	36	36	0	0
4	111	75	0	192	45	52	0	0
5	498	39	0	206	86	77	0	0
6	249	54	0	184	98	88	0	0
7	133	22	0	130	52	13	0	0
8	358	28	0	156	114	64	0	0
9	242	93	0	86	71	80	0	0
10	189	45	0	53	99	85	0	0
11	248	28	0	72	90	73	0	0
12	271	31	0	20	75	52	0	0
13	171	27	0	36	76	70	0	0
14	96	46	0	29	52	58	0	0
15	186	52	0	17	67	50	0	0
16	272	52	0	32	150	129	0	0
17	244	57	0	17	142	93	0	0
18	287	53	0	35	142	129	0	0
19	96	37	0	15	92	65	0	0
20	106	19	0	17	72	68	0	0
21	66	24	0	6	55	39	0	0
22	113	37	0	11	62	42	0	0
23	47	55	0	4	53	54	0	0
24	70	59	0	10	77	80	0	0
25	188	22	0	4	139	96	0	0
26	125	24	0	8	129	91	0	0
27	40	34	0	4	38	31	0	0
28	242	56	0	6	74	64	0	0
29	88	69	0	2	76	55	0	0
30	39	47	0	6	43	31	0	0
31	33	36	0	4	72	35	0	0
<b>Totals</b>	<b>5,503</b>	<b>1,328</b>	<b>0</b>	<b>2,766</b>	<b>2,539</b>	<b>1,985</b>	<b>0</b>	<b>0</b>

**Attachment A (continued).** Wells Dam daily fish passage (24-hour count) for September 2010.

Date	Chinook		Coho	Sockeye	Steelhead		Lamprey	Bull Trout
	Adults	Jacks			Ad-clipped	Ad-present		
1	64	66	0	5	118	49	0	0
2	71	38	0	1	81	53	0	0
3	89	20	0	4	122	92	0	0
4	188	30	0	4	79	66	0	0
5	186	29	2	1	72	39	0	0
6	122	21	0	1	101	70	0	0
7	87	9	0	1	101	64	0	0
8	104	15	0	2	106	69	0	0
9	97	24	0	2	110	58	0	0
10	44	19	0	2	125	59	0	0
11	70	23	0	1	102	53	0	0
12	60	11	0	1	105	58	0	0
13	40	18	0	1	126	69	0	0
14	25	8	0	0	52	40	0	0
15	51	21	0	1	127	78	0	0
16	52	15	1	1	123	68	0	0
17	80	19	0	1	175	110	0	0
18	71	21	1	0	142	133	0	0
19	67	15	0	0	134	94	0	0
20	46	9	2	1	103	61	0	0
21	19	18	5	0	72	53	0	0
22	45	8	13	1	149	133	0	0
23	74	21	4	1	125	101	0	0
24	59	32	3	0	123	90	0	0
25	23	30	7	2	77	89	0	0
26	92	30	15	0	105	76	0	0
27	31	13	10	0	61	25	0	0
28	11	11	3	0	59	24	1	0
29	38	8	19	0	69	40	0	0
30	26	13	24	0	108	69	0	0
<b>Totals</b>	<b>2,032</b>	<b>615</b>	<b>109</b>	<b>34</b>	<b>3,152</b>	<b>2,083</b>	<b>1</b>	<b>0</b>

**Attachment A (continued).** Wells Dam daily fish passage (24-hour count) for October 2010.

Date	Chinook		Coho	Sockeye	Steelhead		Lamprey	Bull Trout
	Adults	Jacks			Ad-clipped	Ad-present		
1	25	11	12	1	61	50	0	0
2	39	9	40	1	78	48	0	0
3	66	4	27	0	61	35	0	0
4	16	24	17	0	44	25	0	0
5	32	15	14	0	56	25	0	0
6	33	3	28	0	39	35	0	0
7	33	16	16	0	46	27	0	0
8	17	11	16	0	49	45	0	0
9	24	10	12	0	29	36	0	0
10	36	15	21	0	60	41	0	0
11	8	3	10	0	20	9	0	0
12	16	2	12	0	27	15	0	0
13	23	10	30	1	42	18	0	0
14	22	13	40	1	39	37	0	0
15	54	12	39	2	37	47	0	1
16	30	4	45	0	29	19	0	0
17	35	14	40	1	24	28	0	0
18	26	9	17	0	6	9	0	0
19	17	6	10	1	8	5	0	0
20	10	10	20	0	4	8	0	0
21	63	7	34	0	32	12	0	0
22	38	4	25	0	11	4	0	0
23	30	4	19	0	13	7	0	0
24	45	11	43	1	20	12	0	0
25	19	3	27	1	7	6	0	0
26	19	2	37	1	17	13	0	0
27	15	3	43	0	19	15	0	0
28	5	8	39	0	10	6	0	0
29	17	1	50	0	8	13	0	1
30	3	0	41	0	8	9	0	0
31	3	0	52	0	12	6	0	0
<b>Totals</b>	<b>819</b>	<b>244</b>	<b>876</b>	<b>11</b>	<b>916</b>	<b>665</b>	<b>0</b>	<b>2</b>

**Attachment A (concluded).** Wells Dam daily fish passage (24-hour count) for November 1-15, 2010.

Date	Chinook		Coho	Sockeye	Steelhead		Lamprey	Bull Trout
	Adults	Jacks			Ad-clipped	Ad-present		
1	29	4	40	0	10	10	0	0
2	10	0	37	0	11	12	0	0
3	22	0	26	0	17	23	0	0
4	6	1	27	0	16	21	0	0
5	16	4	22	0	13	22	0	0
6	16	1	9	0	10	14	0	0
7	7	0	12	0	12	11	0	0
8	8	2	13	0	5	12	0	0
9	4	0	17	0	9	9	0	0
10	2	0	13	0	17	21	0	0
11	2	0	10	0	16	15	0	0
12	3	0	7	0	23	10	0	0
13	6	0	6	0	7	8	0	0
14	2	0	5	0	10	3	0	0
15	2	0	5	0	3	5	0	0
<b>Totals</b>	<b>135</b>	<b>12</b>	<b>249</b>	<b>0</b>	<b>179</b>	<b>196</b>	<b>0</b>	<b>0</b>

**Attachment B. Wells Dam Annual Ladder Counts of Salmon and Steelhead for a 16-hour Daily Count Period (1967-2010)**

Year	Chinook Spring	Chinook Summer	Chinook Fall	Chinook Trapped	Chinook Total	Coho <sup>1</sup>	Sockeye	Steelhead	Steelhead Trapped	Steelhead Total	Total Salmonids	Count Dates Include:
1967	1,157	12,504	2,732	2,004	18,397	255	113,232	1,474	171	1,645	133,529	5/21-11/19
1968	4,931	8,922	2,623	2,277	18,753	221	81,530	2,112	413	2,525	103,029	5/01-11/15
1969	3,599	6,846	2,929	2,873	16,247	29	17,352	1,391	530	1,921	35,549	5/01-11/15
1970	2,670	8,003	4,388	1,745	16,806	62	50,667	1,597	399	1,996	69,531	5/01-11/15
1971	3,168	5,988	2,030	1,793	12,979	161	48,172	3,782	358	4,140	65,452	4/30-11/15
1972	3,616	4,141	2,419	1,694	11,870	665	33,398	1,894	354	2,248	48,181	4/30-11/15
1973	2,937	5,052	2,650	2,088	12,727	331	37,178	1,820	627	2,447	52,683	4/30-11/15
1974	3,420	4,567	1,114	2,893	11,994	112	16,716	580	260	840	29,662	5/01-10/31
1975	2,225	8,522	3,806	3,253	17,806	25	22,286	517	227	744	40,861	5/01-10/31
1976	2,759	7,901	3,843	2,518	17,021	99	27,619	4,664	337	5,001	49,740	5/01-11/15
1977	4,211	7,527	3,260	2,628	17,626	68	21,973	5,282	355	5,637	45,304	5/01-11/15
1978	3,615	6,419	1,336	2,259	13,629	77	7,458	1,621	356	1,977	23,141	5/01-10/31
1979	1,103	10,080	1,108	2,352	14,643	63	22,655	3,695	367	4,062	41,423	5/01-11/16
1980	1,182	4,892	709	1,827	8,610	82	26,573	3,443	372	3,815	39,080	5/01-11/22
1981	1,935	4,276	686	1,533	8,430	26	28,234	4,096	650	4,746	41,436	5/01-11/22
1982	2,401	3,349	2,064	700	8,514	357	19,005	7,984	590	8,574	36,450	5/01-11/22
1983	2,869	2,821	1,150	942	7,782	82	27,925	19,525	670	20,195	55,984	5/01-11/30
1984	3,280	5,941	1,812	1,094	12,127	104	81,054	16,632	690	17,322	110,607	5/01-11/25
1985	5,257	4,456	2,097	1,689	13,499	72	53,170	19,867	750	20,617	87,358	5/01-11/22
1986	3,150	4,178	1,143	1,118	9,589	87	34,876	13,303	650	13,953	58,505	5/01-11/14
1987	2,344	3,142	3,253	1,275	10,014	42	39,948	5,493	603	6,096	56,100	5/01-11/13
1988	3,036	2,775	1,935	1,364	9,110	75	33,980	4,401	651	5,052	48,217	5/01-10/31
1989	1,740	3,333	1,435	2,147	8,655	14	15,895	4,600	716	5,316	29,880	5/01-10/31
1990	981	3,354	749	1,109	6,193	32	7,597	3,815	735	4,550	18,372	5/01-11/07
1991	779	2,028	827	1,525	5,159	21	27,492	7,751	726	8,477	41,149	5/01-11/15
1992	1,623	1,967	1,503	895	7,980	28	41,844	7,027	658	7,685	57,537	5/01-11/15
1993	2,444	3,603	1,228	1,780	9,055	19	28,038	2,494	633	3,127	40,239	5/01-11/16
1994	257	4,891	3,017	2,287	10,452	3	1,662	2,163	620	2,783	14,900	5/01-11/15
1995	103	3,076	1,229	2,164	6,572	6	4,801	942	619	1,561	12,940	5/01-11/15
1996	*	2,389	917	1,665	4,971	4	17,703	4,128	509	4,637	27,315	5/01-11/15
1997	971	2,721	766	1,655	6,113	8	25,754	4,107	630	4,737	36,612	5/01-11/15
1998	*	3,799	1,067	1,559	6,425	0	4,135	2,520	460	2,980	13,540	5/01-11/15
1999	345	7,787	2,548	938	11,618	224	12,388	3,504	416	3,920	28,150	5/01-11/15
2000	2,435	9,673	3,049	1,327	16,484	0	53,351	5,575	369	5,944	75,779	5/01-11/15
2001	10,414	35,990	8,634	556	55,594	473	64,819	16,251	392	16,643	137,529	5/01-11/15
2002	7,098	59,540	5,573	556	72,767	104	9,594	8,253	373	8,626	91,091	5/01-11/15
2003	4,480	43,480	7,397	556	55,913	137	24,684	8,721	374	9,095	89,829	5/01-11/15
2004	2,493	31,172	5,265	558	39,488	234	64,959	7,825	452	8,277	112,958	5/01-11/15
2005	4,831	30,842	3,110	563	39,346	273	46,891	6,331	417	6,748	93,258	5/01-11/15
2006	3,996	26,345	4,658	575	35,574	399	18,880	5,877	368	6,245	61,098	5/01-11/15
2007	2,543	15,866	2,356	521	21,286	2,033	19,106	6,574	379	6,953	49,378	5/01-11/15
2008	2,739	20,954	5,788	415	29,896	925	145,067	8,622	370	8,992	207,924	5/01-11/15
2009	7,932	28,148	5,914	473	41,994	2,415	116,964	23,578	367	23,945	185,791	5/01-11/15
2010	7,985	27,462	3,765	593	39,212	996	255,083	11,696	367	12,063	307,354	5/01-11/15
Mean	3,002	11,006	2,700	1,529	18,144	243	37,131	6,182	488	6,670	62,723	
Gmean	2,200	6,999	2,158	1,320	14,126	43	26,533	4,299	462	4,916	51,144	

Chinook counts include jacks. WDFW counting dates: spring Chinook, May1-June 28; summer Chinook, June 29-August 28; Fall Chinook, August 29-November 15.

\*All spring Chinook were trapped for broodstock at Wells Dam; 387 in 1996, and 363 in 1998.

<sup>1</sup>Does not include numbers of coho trapped at Wells Dam by the Yakama Nation for hatchery broodstock; 254 in 2010.

**Attachment C.** Wells Dam Annual Ladder Counts of Salmon and Steelhead for a 24-hour Daily Count Period from 1998-2010.

Year	Chinook Spring	Chinook Summer	Chinook Fall	Chinook Trapped	Chinook Total	Coho <sup>1</sup>	Sockeye	Steelhead	Steelhead Trapped	Steelhead Total	Total Salmonids	Count Dates Include
1998	*	4,108	1,200	1,582	6,890	0	4,669	2,984	460	3,444	15,003	5/01-11/15
1999	345	7,787	2,548	938	11,618	224	12,388	3,504	416	3,920	28,150	5/01-11/15
2000	2,587	10,156	3,418	1,327	17,488	0	59,944	6,280	369	6,649	84,081	5/01-11/15
2001	10,871	38,126	9,591	556	59,144	612	74,490	18,528	392	18,920	153,166	5/01-11/15
2002	7,626	62,623	6,472	556	77,277	132	10,768	9,478	373	9,851	98,028	5/01-11/15
2003	4,702	46,391	8,253	556	59,902	168	28,977	9,963	374	10,337	99,384	5/01-11/15
2004	4,793	32,847	5,777	558	43,975	291	78,053	9,317	452	9,769	132,088	5/01-11/15
2005	4,996	31,763	3,461	563	40,783	348	55,559	7,203	417	7,620	104,310	5/01-11/15
2006	4,376	27,196	5,043	575	37,190	409	22,075	6,674	368	7,042	66,716	5/01-11/15
2007	2,793	16,817	2,670	521	22,801	2,432	22,273	7,500	379	7,879	55,385	5/01-11/15
2008	3,134	22,435	6,423	415	32,407	1,191	165,334	9,808	370	10,178	209,110	5/01-11/15
2009	8,174	29,525	6,326	473	44,498	2,989	134,937	25,422	367	25,789	208,213	5/01-11/15
2010	8,257	28,950	4,256	593	42,056	1,234	291,766	12,929	367	13,296	348,352	5/01-11/15

Chinook counts include jacks. WDFW counting dates: spring Chinook, May1-June 28; summer Chinook, June 29-August 28; Fall Chinook, August 29-November 15.

\*All spring Chinook were trapped for broodstock at Wells Dam; 387 in 1996, and 363 in 1998.

<sup>1</sup>Does not include numbers of coho trapped at Wells Dam by the Yakama Nation for hatchery broodstock; 254 in 2010.

**Attachment D.** Wells Dam Daily Water Quality Report, 2010

Day	April			May			June			July		
	Temp (C) Mean	TDG%		Temp (C) Mean	TDG%		Temp (C) Mean	TDG%		Temp (C) Mean	TDG%	
		Forebay Mean	Tailrace Mean		Forebay Mean	Tailrace Mean		Forebay Mean	Tailrace Mean		Forebay Mean	Tailrace Mean
1	5.8	.	.	7.3	104.0	105.0	11.2	105.3	107.0	14.1	110.6	116.1
2	5.7	.	.	7.9	104.1	105.4	11.2	105.6	107.4	14.1	111.8	115.4
3	5.6	.	.	8.1	104.5	105.9	11.2	105.4	106.8	14.0	112.6	114.2
4	5.5	.	.	7.6	103.1	104.6	11.3	105.2	106.9	14.2	111.1	112.3
5	5.8	.	.	7.2	102.4	104.2	11.5	104.8	106.4	14.6	110.5	112.0
6	5.8	.	.	7.3	102.7	104.2	11.8	104.9	106.0	14.5	109.8	111.4
7	5.9	.	.	7.5	102.5	104.1	12.0	105.0	106.5	14.5	110.6	111.6
8	6.1	.	.	7.5	102.7	104.1	12.0	105.1	106.9	14.9	111.6	112.7
9	6.1	.	.	7.7	103.7	105.0	11.8	109.3	110.3	14.8	112.7	114.7
10	6.3	.	.	8.2	105.0	105.9	11.8	110.0	112.6	15.0	113.5	114.6
11	6.2	.	.	8.5	104.9	106.2	12.1	111.2	113.6	15.6	113.1	114.2
12	6.3	.	.	8.8	104.4	105.9	12.3	111.4	113.8	15.9	113.3	114.2
13	6.5	.	.	9.0	105.0	106.7	12.7	108.1	109.8	15.9	111.0	112.9
14	6.6	.	.	9.4	105.1	106.7	13.0	112.2	113.2	15.7	109.6	111.2
15	6.7	.	.	9.7	105.2	106.7	12.8	107.0	109.5	15.7	110.8	114.8
16	6.8	.	.	10.0	105.6	106.7	12.5	105.8	112.1	15.6	111.2	112.6
17	6.9	.	.	10.2	106.1	107.1	12.0	106.0	111.4	15.7	111.7	113.3
18	7.2	.	.	10.1	105.7	107.3	12.1	110.3	113.8	16.1	112.6	113.7
19	7.2	100.8	94.8	10.2	104.7	106.0	12.3	111.6	114.8	16.5	112.3	113.1
20	7.2	108.1	105.5	10.0	104.9	106.4	12.9	112.3	113.9	16.8	112.1	113.1
21	7.3	108.1	106.1	9.9	103.8	105.4	13.0	108.6	110.4	16.6	112.7	113.7
22	7.4	107.4	106.2	9.8	104.8	106.3	13.0	110.5	119.8	16.6	113.2	114.4
23	7.5	106.5	107.2	10.0	105.0	106.7	12.9	110.7	116.6	16.8	111.8	113.3
24	7.6	105.6	107.2	10.2	105.0	106.5	13.5	113.3	119.1	17.3	110.5	111.9
25	7.8	104.3	108.3	10.1	104.7	106.1	13.6	111.0	115.2	17.5	112.0	112.8
26	7.9	104.8	109.2	10.1	105.2	106.6	13.8	110.9	117.3	17.9	112.8	113.6
27	7.7	106.7	109.3	10.0	104.5	106.2	13.7	111.5	119.3	17.4	113.4	115.0
28	7.4	106.5	108.9	10.2	104.0	105.7	13.8	112.2	116.3	17.1	112.5	114.6
29	7.2	105.3	107.8	10.3	103.5	105.4	14.0	113.2	119.7	17.0	111.8	113.4
30	7.0	103.6	107.1	10.7	103.9	105.8	14.1	110.0	114.8	17.5	111.9	113.6
31	.	.	.	11.0	104.9	106.4	.	.	.	17.8	112.0	113.7
<b>Mean</b>	6.7	105.6	106.5	9.2	104.4	105.9	12.5	109.0	112.4	15.9	111.8	113.5

**Attachment D (continued).** Wells Dam Daily Water Quality Report, 2010

Day	August			September			October		
	Temp (C) Mean	TDG%		Temp (C) Mean	TDG%		Temp (C) Mean	TDG%	
		Forebay Mean	Tailrace Mean		Forebay Mean	Tailrace Mean		Forebay Mean	Tailrace Mean
1	17.9	111.1	112.8	18.3	103.8	104.1	18.9	100.7	101.3
2	18.0	110.7	112.4	18.2	103.5	103.4	19.1	.	.
3	18.0	111.1	112.9	18.3	104.2	104.0	19.2	.	.
4	17.8	110.4	112.5	18.4	106.4	105.8	19.1	.	.
5	17.6	110.5	111.7	18.3	105.9	105.6	18.8	.	.
6	17.3	112.5	113.7	18.5	104.6	104.9	18.7	.	.
7	17.6	111.2	112.7	18.4	103.4	103.6	18.6	.	.
8	17.9	109.8	110.9	18.3	103.6	103.6	18.4	.	.
9	18.1	110.4	111.3	18.3	104.5	104.3	18.3	.	.
10	18.2	110.3	111.6	18.2	104.6	104.8	18.3	.	.
11	18.2	109.5	111.2	18.2	104.2	104.1	18.0	.	.
12	18.2	109.5	111.1	18.3	104.6	104.1	17.8	.	.
13	17.7	110.1	111.7	18.2	104.5	104.4	17.8	.	.
14	18.2	108.6	110.1	18.2	105.6	105.3	17.7	.	.
15	18.6	108.4	110.0	18.4	106.3	105.5	17.6	.	.
16	18.8	109.5	110.4	18.5	106.0	105.7	17.3	.	.
17	18.7	110.3	111.8	18.6	105.8	105.8	17.1	.	.
18	18.5	110.2	112.2	18.5	105.6	105.8	17.0	.	.
19	18.7	109.0	110.8	18.6	106.2	106.4	16.8	.	.
20	18.7	108.6	109.5	18.5	105.6	105.9	16.7	.	.
21	18.8	107.7	109.0	18.6	104.0	104.5	16.6	.	.
22	18.8	106.5	107.1	18.4	102.8	103.4	16.4	.	.
23	19.1	105.4	106.3	18.3	103.0	103.3	16.3	.	.
24	18.7	105.0	106.0	18.1	101.5	101.9	16.2	.	.
25	18.8	106.6	108.0	18.1	100.9	100.7	16.0	.	.
26	18.7	107.4	109.8	18.2	101.8	101.4	15.7	.	.
27	18.1	107.3	109.0	18.3	102.1	102.0	15.6	.	.
28	18.1	106.6	108.2	18.5	102.2	102.5	15.5	.	.
29	18.3	106.7	107.9	18.7	101.3	101.5	15.4	.	.
30	18.6	105.7	107.3	18.4	101.1	101.3	15.4	.	.
31	18.6	104.4	104.7	.	.	.	15.2	.	.
<b>Mean</b>	18.3	108.7	110.1	18.3	104.0	104.0	17.3		