

# ANNUAL REPORT OF OPERATIONS

## FISH FACILITIES: 2005

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

April 2006



# FISH FACILITIES OPERATIONS ANNUAL REPORT FOR 2005

## WELLS HYDROELECTRIC PROJECT, NO. 2149

### Located on the Columbia River at River Mile 515.8

#### 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 viewing video records of fish swimming past ladder windows. The ladders were operational 24 hours a day. A summary of the counting season by month is shown in Table 1. Attachment 1 shows the 24-hour record (0000-2400 PST) by species by day from May through November 15th. Attachment 2 shows the annual summary from 1967 through 2005 of salmon and steelhead counts at Wells Dam using the historic 16-hour count format, and for comparison, Attachment 3 shows the 24-hour count totals for the years 1998 through 2005 in addition to the 16-hour count data from 1967 through 1997.

B. Monthly and annual fish counts of each species by ladder for 24-hour and 16-hour count periods are included in Tables 1 and 2, respectively (note that Table 1 includes bull trout [*Salvelinus confluentus*] and lamprey [*Lampetra tridentata*], while Table 2 does not). Table 3 shows the nighttime percent of total adult passage of salmon and steelhead. Broodstock of spring, summer, and fall Chinook and steelhead removed from the ladders are not included in the fish passage summaries. Numbers of fish removed for broodstock are shown in Tables 4 and 5.

C. Bull trout were listed as "Threatened" under the Endangered Species Act on June 10, 1998 for the Klamath and Columbia rivers. Bull trout passage records were first initiated at Wells Dam in 1999. Bull trout counts were recorded from May 1 through November 15, 2005 (see Table 1), and daily passage numbers for 2005 are found in Table 6. Additionally, the winter bull trout counts that were initiated during the winter of 2004-2005 were continued during the winter of 2005-2006. No bull trout have been observed using the fish ladders at Wells Dam during the winter counts.

D. Lamprey passage records were first initiated at Wells in 1995. Lamprey counts were recorded from May 1 through November 15, 2005 (see Table 1), and daily passage numbers for 2005 are shown in Table 7.

#### II. PROJECT OPERATIONS

##### A. Adult Fish Passage Facilities

The adult fish passage facilities were operated using the criteria established by the Wells Long-Term Settlement Agreement and more recently incorporated into the Wells Habitat Conservation Plan (HCP), and in cooperation with the Fisheries Agencies and Tribes. Information from several years of radio-telemetry studies with both salmon and steelhead at Wells Dam showed that ladder passage time was reduced by closing the side entrance at both

east and west ladders. Based upon approval of the Joint Fisheries Parties who serve on the Wells Coordinating Committee, a decision was made in 2001 to change the ladder operation criteria at Wells Dam closing 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 east ladder from December 1, 2005 through January 13, 2006; and on the west ladder from January 10 through February 24, 2005. The ladders operated at criteria throughout the entire fish passage assessment period.

## **B. Juvenile Bypass Facilities**

The juvenile bypass facilities at Wells Dam are designed to attract downstream migrant salmonids before they enter the turbine intakes. The hydrocombine design of Wells Dam combines the spillways and powerhouse components of the dam into a single 1,130-foot-long section, where all flow through the dam must pass. Five spillways, located above paired turbine intakes, are equipped with bypass flow barriers. Because of the hydrocombine design, flow through the turbine intakes attracts juvenile salmonid migrants to the bypass facilities, where they are attracted by water velocities at slotted bypass barriers and pass the project with a small volume of bypass flow.

The spring 2005 operation of the juvenile bypass facilities began on April 12 and continued on a 24-hour schedule until the end of the spring migration on June 13. Over 63 days, 1.1 MAF (million acre feet) of water or 7.6% of the project inflow was used for spring bypass operations. During the spring bypass period, there was forced spill for 67 hours or 4.4% of the time. The highest hour of forced spill was on May 27 with 96.8 kcfs spilled. Most of the forced spill observed in 2005 was a result of the District conducting the first year of a two-year study to develop relationships between spill, spillway operations, tailwater elevation and observed levels of total dissolved gas in the tailrace of the dam. The highest hourly discharge at the project occurred on May 25<sup>th</sup> at 2100 hours with 221.5 kcfs flowing through the project.

Summer bypass operations began on June 14 and ran through August 26, for a total of 74 days. The summer operation used 1.3 MAF of water, which was 6.8% of the project inflow. During the summer bypass operating period, there were 26 hours (1.5% of the time) of forced spill.

The operation of the bypass in 2005 was consistent with operational timing specified in the Wells HCP. In the past, hydroacoustics and fyke netting have provided real-time fish migration data. The fixed dates of bypass operation were established from 21 years of hydroacoustic and 14 years of species composition information collected on juvenile run patterns and timing at Wells Dam.

## **III. WATER QUALITY**

Average daily turbidity, water temperature and total dissolved gas readings from April 1 through November 15 are shown in Attachment 4. Starting in 2003, water temperature was collected at the fish ladder attraction flow pumps located in the tailrace of Wells Dam. Historically, water temperature data have been collected at the turbine cooling water intake at Unit 5. Turbidity values are Secchi disc readings in feet. Total Dissolved Gas (TDG) is reported for both the forebay and tailwater as the 12-hour high average (12h) in percent TDG. The high TDG values at the tailrace TDG monitoring station in late May and early June (see Attachment 4) were the result of experimental spill during an investigation of the effects of various operational

configurations (spill and generation) on tailrace TDG levels (see Section V(D) below). The investigation was conducted between May 23 and June 6.

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

The Washington Department of Fish and Wildlife (WDFW) is responsible for managing the commercial, sport, and non-game fish and wildlife resources of the state. The Wells and Methow hatcheries are owned and funded by Public Utility District No. 1 of Douglas County (District), and operated by WDFW. WDFW personnel provided the information on summer/fall Chinook and steelhead production at the Wells Hatchery (see Table 4) and spring Chinook production at the Methow Hatchery (see Table 5) in 2005.

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

The District funded several fish-related studies and programs during 2005. A summary of each follows.

##### **A. Sockeye Salmon Enhancement**

At the end of 2001, the Wells Coordinating Committee agreed to shift focus on the District's sockeye responsibility from an experimental sockeye hatchery program to an Okanogan River water management plan. Untimely or excessive water released from Okanogan Lake has been found to adversely affect the survival of both sockeye and kokanee during the winter and spring months when eggs are incubating in gravels. The new plan involved working with the Canadian fisheries parties to develop a model-based flow management program to aid in the reduction of damaging flows. The Fish Water Management Tool (FWMT) program developed a model that allows both fish and water managers to determine how releases of water would affect kokanee and sockeye resources, flood control, water-dependent recreation, and irrigators. During 2003, considerable time was spent on the FWMT model development and 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 past twenty-five years. The retrospective analyses indicated that the average improvement in salmon survival from water management was about 55 percent, equating to a savings of approximately 384,000 smolts per year. According to the model, estimated smolt savings are better in a wet year (75%) rather than a dry year (38%) because of the avoidance of egg scour. The best improvement year showed a 443-percent improvement. On October 5, 2004, the fisheries parties to the Wells HCP Hatchery Committee approved the FWMT program as meeting the sockeye mitigation responsibility for unavoidable losses at Wells Dam.

The 2005 water year provided the first opportunity for the implementation of the FWMT in the management of the Okanogan River. An Operational Team comprising water managers and fisheries scientists, utilized the FWMT to make water-management decisions during an unusually chaotic water year, and by the end of the season the team members expressed support for annual operational deployment of the FWMT and the team approach to decision making. Despite the atypical climatic and hydrologic conditions experienced during this first year of FWMT implementation, the Operational Team was able to manage river flows and lake levels in a manner that effectively minimized property damage and fisheries losses. Thus, the

performance of the FWMT was consistent with expectations based upon the retrospective analyses performed in 2004. Considering the positive results of using the FWMT as predicted by the retrospective analyses and the confirmation of those results with the first year of implementation of the FWMT, the District will continue to support the FWMT program in 2006.

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

The National Marine Fisheries Service's 2000 Biological Opinion required that the District 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 fish migration season. The PIT-tag detection equipment located in each ladder consists of four coils in Pools 67 and 68. These pools are control weirs with two hanging-orifice passageways, and each orifice on each of the four weirs was equipped with a PIT-tag detection coil connected to a series of computers. These computers transmit the PIT-tag interrogation information directly to the PITAGIS Database. This system was tested with 198 sockeye salmon that were captured in the ladder, tagged with PIT-tags and marked with a visual tag. The system was also evaluated by an analysis of 1,315 in-river PIT-tagged adults. The analysis from both of these tests showed the system had a detection efficiency of 99.9%.

The adult traps in each fishway are below Pools 67 and 68. Thus, PIT-tagged adult fish that were diverted from the fishway at each trap were not monitored by the PIT-tag detection system. To increase the coverage of the PIT-tag detection system, additional PIT-tag detectors were installed in 2004 on the exit of each trap to provide detection of PIT-tagged fish collected at the traps. The PIT-tag detector on the exit from the west ladder trap was damaged during 2005, and was removed for repair in October, near the end of the steelhead trapping season. Subsequent to the removal of the damaged PIT-tag detector, Wells Hatchery staff used a hand-held wand detector to read PIT-tags from steelhead captured via the west ladder trap. The repaired detector will be installed prior to the adult spring Chinook migration in the spring of 2006.

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

The District contracted for removal of and data collection on northern pikeminnow (*Ptychocheilus oregonensis*) from the Wells tailrace and reservoir. Northern pikeminnow have been identified as a major predator of juvenile salmonids. In 2005, the contractor used long-line gear to capture 23,336 northern pikeminnow. Of that total, 21,152 northern pikeminnow were over 9" in fork length and 2,184 were less than 9" in fork length. These fish were captured during 5,305 hours of angling effort translating into an overall catch-per-unit-effort (CPUE) or fish-per-hour value of 4.4. 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.). A majority of the fish were captured within the lower Wells Reservoir (15,596 fish during 3,370 angling hours, CPUE = 4.6). Angling efforts in the lower 1-mile section of the Methow River captured 429 fish during 126 hours of effort (CPUE = 3.4). Twenty-six northern pikeminnow were captured in the upper Wells Reservoir near the mouth of the Okanogan River, during 33 hours of angling effort translating into a CPUE of 0.8. The remaining fish were captured in the Wells tailrace (7,285 pikeminnow during 1,776 hours; CPUE = 4.1). The 23,336 pikeminnow were captured over 7,526,400 hook hours, translating into an overall hook catch per unit effort of 0.003 fish per hook hour or 333 hook hours per fish.

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

The volume of water in the Columbia passing Wells Dam in 2005 in April through September was 95 percent of the twenty year average. As noted above, the maximum hourly discharge recorded was 221,500 cfs on May 25. During 2005, TDG data were collected from the forebay and tailwater of Wells Dam. The forebay TDG monitor recorded 12 hour average levels from 100.9 – 110.8 percent. The tailwater monitor recorded 12-hour average levels from 102.7 – 116.8 percent. Operations of the juvenile bypass system at Wells Dam resulted in only slight increases in dissolved gasses in the Columbia River.

During the spring of 2005 (23 May and 6 June), the District commissioned a TDG study at the Wells Dam designed to describe TDG pressures resulting from eight pre-arranged spill scenarios. The powerhouse and spillway were operated through a predetermined range of operational scenarios that varied the total flow, total spill, generation output, and location of the spillway discharge. Total spillway discharges ranged from 26-38% of the total project discharge and were considered inadequate for developing TDG production curves for the spillway.

Comparisons of estimated and empirical tailwater TDG saturations indicated that powerhouse released water exited the stilling basin with an increase of 3.9-8.0% in TDG saturation over forebay values. The trend was consistent across all eight scheduled tests. Operational patterns consisting of spill over generating turbines resulted in higher increases than other configurations.

Spill from the west side of the spillway resulted in consistently higher TDG saturations than similar spill discharges from the east side. This may have resulted from the path of the spill flow across powerhouse flow (from west to east). Flat spill patterns consisting of near equal distribution of spill across the entire spillway yielded higher TDG saturations than crowned spill for similar total project discharges. This supported the idea of gassed powerhouse discharge since flat spill patterns involved more spill over generating units than did crowned spills.

#### **E. Bull Trout Radio-Telemetry**

Starting in 2001 and continuing through 2004, the District has participated in regionally coordinated bull trout telemetry studies. A study initiated in 2001 radio tagged 79 bull trout at mid-Columbia River dams in 2001 and 2002. The passage times and migration rates for these fish were monitored at Rock Island, Rocky Reach and Wells dams. Reservoir passage and tributary monitoring was also conducted. Monitoring for bull trout tagged in 2002 with 24-month radio tags continued through December 2004, but no tags were detected during 2004. Based upon the results of these studies, Wells project operations do not appear to negatively influence bull trout survival, migration and spawning success.

In consultation with the FERC and the U.S. Fish and Wildlife Service per the 2004 Biological Opinion on bull trout, the District has developed the *Wells Hydroelectric Project Bull Trout Monitoring and Management Plan, 2004-2008*. The primary goal of this plan is to 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. In May and June of 2005, the District tagged six adult bull trout at Wells Dam with radio transmitters, and monitored upstream and downstream passage through the dam and movements of tagged fish while in the Project area (dam and reservoir). Additionally 16 sub-adult bull trout were tagged with PIT tags at tributary traps. Genetic samples were also taken from all radio- and PIT-tagged fish, in an effort to determine the Core Areas and Local Populations of those fish that utilize the Wells Project area. None of the radio-

tagged fish fell back over the dam, and all were eventually tracked into the Methow River; none of the PIT-tagged fish have been detected passing the dam. The study will continue through July 2008.

**VI. EXPENSES for the 2005 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	\$1,295,511	\$881,280
2. Supervision of Fish & Game Facilities	\$214,297	\$214,297
3. Operation of District Methow Hatchery	\$866,157	\$53,989
4. Non-study Miscellaneous Expenditures	\$66,966	\$66,966
5. Maintenance of District Fish Facilities	\$48,945	\$48,945
6. Maintenance, Miscellaneous Fish Related	\$9,655	\$9,655
7. Annual Debt Service on Fish and Game Plant	\$3,091,831	\$3,091,831
Totals	<u>\$5,587,982</u>	<u>\$4,366,964</u>

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

**B. Licensee Fisheries Study Costs**

1. Fish Studies	\$731,234
2. Fish Studies – Methow Hatchery Evaluation	\$600,794
3. Mid-Columbia Endangered Species Studies	\$18,591
	<u>\$1,350,619</u>



**Table 1.** Wells Dam fish counts; Monthly Summaries for 24 hour count period; 2005

Month	Chinook Salmon							Coho	Sockeye	Steelhead		Total Steelhead	Bull Trout	Lamprey	
	Spring		Summer		Fall		Total Chinook			Hatchery	Wild				
May	1,542	43					1,585			9	54	63	14		
June	3,355	56	1,079	12			4,502		1,304	1	13	14	33		
July			22,977	442			23,419		50,984	139	227	366	2	20	
August			7,010	243	222	24	7,499		3,178	917	673	1590		55	
September							1,776	282	2,058	14	82	2,166	1,121	3287	89
October							717	141	858	283	11	1,134	604	1738	47
November							294	5	299	51		77	68	145	1
Total	4,897	99	31,066	697	3,009	452	40,220	348	55,559	4,443	2,760	7,203	49	212	

Wells fish counts were made using WDFW conversion dates

Spring Chinook May 1 - June 28

Summer Chinook June 29 - August 28

Fall Chinook August 29 - November 15.

**Table 2.** Wells Dam fish counts; Monthly Summaries for 16 hour count period; 2005 (counting from 0400 - 2000 PST)

Month	Chinook Salmon						Coho	Sockeye	Steelhead	
	Spring		Summer		Fall				Hatchery	Wild
	Adults	Jacks	Adults	Jacks	Adults	Jacks				
May	1,492	38						8	48	
June	3,251	50	1,058	10				1,142	1	12
July			22,479	433				42,949	136	219
August			6,636	226	207	22		2,726	881	636
September					1,681	244	14	64	1,824	948
October					612	123	224	10	977	530
November					217	4	35		48	63
Total	4,743	88	30,173	669	2,717	393	273	46,891	3,875	2,456

**Table 3.** Wells Dam fish counts; Percentage of night passage, 2005 (Percent seen between the hours 000 - 0400 and 2000 - 2400)

Month	Chinook Salmon						Coho	Sockeye	Steelhead	
	Spring		Summer		Fall				Hatchery	Wild
	Adults	Jacks	Adults	Jacks	Adults	Jacks				
May	3%	12%						11%	11%	
June	3%	11%	2%	17%			12%		8%	
July			2%	2%			16%	2%	4%	
August			5%	7%	7%	8%	14%	4%	5%	
September					5%	13%	22%	16%	15%	
October					15%	13%	9%	14%	12%	
November					26%			38%	7%	
Total	3%	11%	3%	4%	10%	13%	16%	13%	11%	

Wells fish counts were made using WDFW conversion dates

Spring Chinook May 1 - June 28

Summer Chinook June 29 - August 28

Fall Chinook August 29 - November 15.

**Table 4.** Production from the Wells Hatchery in 2005

	Summer Chinook	Summer Steelhead <sup>1</sup>
Adult broodstock trapped, 2005	1,271	351
Jacks broodstock trapping, 2005	10	0
Females spawned in 2005	601	196
Eggs taken, 2005	2,582,600	1,067,303
Eggs transferred, 2005	1,339,898	317,437
Juveniles released, 03 brood	313,509	0
Juveniles released, 04 brood	488,857	364,546
Lake Chelan (eyed eggs)	19,393	0

<sup>1</sup> Adult steelhead collected for broodstock are held and spawned during the following year, thus, the 2006 brood were actually collected at Wells Dam during 2005.

**Table 5.** Spring Chinook Production from the Methow Hatchery in 2005

	Twisp R.	Chewuch R.	Methow R.
Adults trapped, 2005 brood	17	12	212
Females spawned, 2005 brood	6	102 <sup>1</sup>	
Eggs taken, 2005 brood	27,300 <sup>2</sup>	397,800 <sup>3</sup>	
Juveniles released, 2003 brood	125,707	127,614	48,831

<sup>1</sup>The hatchery reported the number of females spawned from the Chewuch River and all Methow River collection locations as a combined total of 102, and did not provide numbers of females spawned categorized by collection location.

<sup>2</sup>Brood also include a combination of captive brood, hatchery outfall and CWT identified fish collected in neighboring basins.

<sup>3</sup>The hatchery reported eggs only as Methow Composite, with no distinction for subbasin of origin; number reported is estimated.

Note: In 2005, Spring Chinook adults were trapped at the Twisp tributary trap, the Methow Hatchery outfall channel, the Winthrop National Hatchery outfall, and Foghorn Dam. There were no adults transferred to the Winthrop National Hatchery.

**Table 6. Passage of Bull Trout at Wells Dam, 2005**

Day	April	May	June	July	Aug	Sept	Oct	Nov
1	0	0	2	1	0	0	0	0
2	0	0	1	0	0	0	0	0
3	0	0	1	0	0	0	0	0
4	0	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0	0
6	0	0	0	1	0	0	0	0
7	0	0	3	0	0	0	0	0
8	0	0	2	0	0	0	0	0
9	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0
11	0	0	0	0	0	0	0	0
12	0	0	1	0	0	0	0	0
13	0	1	1	0	0	0	0	0
14	0	0	0	0	0	0	0	0
15	0	0	1	0	0	0	0	0
16	0	0	1	0	0	0	0	
17	0	1	1	0	0	0	0	
18	0	0	0	0	0	0	0	
19	0	2	2	0	0	0	0	
20	0	1	1	0	0	0	0	
21	0	0	1	0	0	0	0	
22	0	0	0	0	0	0	0	
23	0	1	2	0	0	0	0	
24	0	0	4	0	0	0	0	
25	0	0	5	0	0	0	0	
26	0	2	0	0	0	0	0	
27	0	0	3	0	0	0	0	
28	0	0	1	0	0	0	0	
29	0	2	0	0	0	0	0	
30	0	1	0	0	0	0	0	
31	**	3	**	0	0	**	0	
<b>Total</b>	<b>0</b>	<b>14</b>	<b>33</b>	<b>2</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>

Season total 49

**Table 7. Passage of Lamprey at Wells Dam, 2005**

Day	April	May	June	July	Aug	Sept	Oct	Nov
1	0	0	0	0	0	7	3	0
2	0	0	0	0	2	5	2	0
3	0	0	0	1	0	3	4	1
4	0	0	0	0	0	4	2	0
5	0	0	0	2	4	6	4	0
6	0	0	0	1	1	6	1	0
7	0	0	0	2	2	5	1	0
8	0	0	0	0	0	5	1	0
9	0	0	0	0	0	0	0	0
10	0	0	0	0	3	3	0	0
11	0	0	0	0	2	5	0	0
12	0	0	0	0	0	2	0	0
13	0	0	0	0	2	3	2	0
14	0	0	0	0	1	2	3	0
15	0	0	0	4	2	2	1	0
16	0	0	0	2	4	1	6	
17	0	0	0	3	1	2	1	
18	0	0	0	0	2	1	0	
19	0	0	0	0	1	1	1	
20	0	0	0	0	1	2	4	
21	0	0	0	2	2	1	0	
22	0	0	0	1	1	2	2	
23	0	0	0	-1	7	4	0	
24	0	0	0	2	5	3	1	
25	0	0	0	0	1	4	3	
26	0	0	0	0	1	4	2	
27	0	0	0	0	3	1	1	
28	0	0	0	1	2	2	1	
29	0	0	0	0	3	2	0	
30	0	0	0	0	0	1	1	
31	**	0	**	0	2	**	0	
<b>Total</b>	0	0	0	20	55	89	47	1

Season total 212

**Attachment 1. Wells Dam Daily Fish Passage Report, 2005.**  
 Passage for the hours 0000 to 2400 PST

May-05								Jun-05							
Date	Chinook		Coho	Sockeye	Steelhead Hat	Steelhead Wild	Lamprey	Date	Chinook		Coho	Sockeye	Steelhead Hat	Steelhead Wild	Lamprey
	Adults	Jacks							Adults	Jacks					
1						2	1	44	4						
2						6	2	40	3					2	
3					2	3	3	55	5					1	
4					1	4	4	35	1						
5					1	2	5	44	2						
6	3					3	6	117	8						
7	2				2	1	7	40							
8	2					7	8	28	4						
9	12						9	18	2						
10	21					6	10	27	1						
11	12					1	11	13	3						
12	22					6	12	28	1						
13	150						13	58							
14	80	1				1	14	37							
15	39					1	15	36						1	
16	77					3	16	97						1	
17	61					1	17	59	3		2				
18	257	3				1	18	38	3						
19	28					2	19	40	2		2				
20	24	2					20	49							
21	36	1				1	21	76	1		11				
22	65	1					22	71	2		7				
23	82				3	1	23	119			21				
24	46	1					24	397			43				
25	136						25	449			66			2	
26	46	11					26	622	2		86	1		2	
27	38	4				1	27	326	5		128			2	
28	22	2					28	392	4		126				
29	70	1					29	600	5		357			1	
30	169	15				1	30	479	7		455			1	
31	42	1													
Totals	1542	43	0	0	9	54	0	Totals	4434	68	0	1304	1	13	0

**Attachment 1. Wells Dam Daily Fish Passage Report, 2005 (Continued).**  
 Passage for the hours 0000 to 2400 PST

Jul-05								Aug-05							
Chinook								Chinook							
Date	Adults	Jacks	Coho	Sockeye	Steelhead Hat	Steelhead Wild	Lamprey	Date	Adults	Jacks	Coho	Sockeye	Steelhead Hat	Steelhead Wild	Lamprey
1	924	4		422		1		1	585	9		522	10	11	
2	1254	9		505		8		2	273	8		336	13	8	2
3	720	9		947			1	3	173	12		359	24	17	
4	1211	6		1614		3		4	395	9		391	20	20	
5	1150	9		1237		3	2	5	422	7		223	30	22	4
6	829	6		1603		2	1	6	219	6		176	10	15	1
7	339	4		1216		2	2	7	368	4		202	17	19	2
8	603	13		1668		5		8	198	14		174	12	11	
9	1779	16		1927		6		9	297	12		93	27	13	
10	1127	26		3253	1	2		10	274	26		80	9	9	3
11	323	6		1960				11	177	6		80	45	28	2
12	832	30		4269	3	5		12	614	5		89	36	32	
13	541	16		2545	1	3		13	254	10		58	29	20	2
14	986	23		3710	11	6		14	111	4		69	23	27	1
15	752	12		2445	1	4	4	15	317	2		60	22	9	2
16	807	7		2261		3	2	16	257	4		36	41	19	4
17	487	11		2406	2	9	3	17	228	7		36	28	19	1
18	815	15		1822	2	13		18	202	11		47	53	41	2
19	553	10		1530	5	5		19	236	24		28	51	57	1
20	1120	27		2142	5	12		20	166	13		19	35	49	1
21	757	33		2426	5	2	2	21	112	3		5	30	25	2
22	639	6		1530	3	3	1	22	218	7		28	14	12	1
23	877	19		1466	8	4	-1	23	78	3		10	17	4	7
24	242	12		1249	7	11	2	24	165	5		12	47	19	5
25	471	10		889	8	13		25	233	11		16	89	51	1
26	261	9		719	7	8		26	159	11		5	45	24	1
27	435	5		665	7	18		27	110	7		4	37	21	3
28	631	23		872	6	10	1	28	169	3		7	37	28	2
29	611	20		650	18	26		29	74	5		5	13	19	3
30	370	17		574	13	20		30	73	9		4	45	16	
31	531	29		462	26	20		31	75	10		4	8	8	2
Totals	22977	442	0	50984	139	227	20	Totals	7232	267	0	3178	917	673	55

**Attachment 1. Wells Dam Daily Fish Passage Report, 2005 (Continued).**  
 Passage for the hours 0000 to 2400 PST

Sep-05								Oct-05							
Date	Chinook			Sockeye	Steelhead Hat	Steelhead Wild	Lamprey	Date	Chinook			Sockeye	Steelhead Hat	Steelhead Wild	Lamprey
	Adults	Jacks	Coho						Adults	Jacks	Coho				
1	48	6		5	38	15	7	1	27	11	3	2	51	35	3
2	67	3		6	29	13	5	2	32	2	5	1	72	34	2
3	64	7		1	31	11	3	3	12	3	2	1	58	27	4
4	100	9		7	24	16	4	4	28	9	18		80	34	2
5	123	16		5	39	19	6	5	35	5		1	87	33	4
6	75	3		2	27	9	6	6	17	3			47	35	1
7	60	11		3	41	16	5	7	23	1	4	1	67	28	1
8	76	6		1	36	28	5	8	18	6			42	13	1
9	60	10		3	111	46	0	9	26	8	7		27	17	
10	83	7		2	47	23	3	10	11	5	2		20	11	
11	66	8		5	65	38	5	11	37		4		36	16	
12	46	8		2	29	17	2	12	14	4	4		14	6	
13	40	10		1	63	23	3	13	38	4	15	2	127	29	2
14	53	5		4	79	31	2	14	16	4	3		49	29	3
15	54	5		4	128	80	2	15	22	6	20		49	25	1
16	75	10		1	101	51	1	16	25	11	9		30	22	6
17	80	3		5	43	25	2	17	26	7	24		32	18	1
18	111	3	1	1	123	41	1	18	68	7	14		36	28	
19	48	8	1	3	76	52	1	19	30	9	8		29	20	1
20	85	6		3	49	26	2	20	33	5	19		23	18	4
21	39	19	1	1	99	41	1	21	22	5	17	1	14	19	
22	34	15			92	49	2	22	20	4	30		8	14	2
23	15	21			81	52	4	23	27		16	2	20	12	
24	55	26		2	139	60	3	24	29	6	18		27	25	1
25	36	22		3	80	69	4	25	19		4		12	7	3
26	29	8		1	57	17	4	26	19	1	6		21	4	2
27	33	9		5	96	48	1	27	7	6	7		15	9	1
28	35	13	4	2	97	50	2	28	9	5	12		22	12	1
29	70	5	4	3	181	108	2	29	15	2	6		14	8	
30	16		3	1	65	47	1	30	4	1	1			10	1
								31	8	1	5		5	6	
Totals	1776	282	14	82	2166	1121	89	Totals	717	141	283	11	1134	604	47



**Attachment 1. Wells Dam Daily Fish Passage Report, 2005 (Continued).**  
 Passage for the hours 0000 to 2400 PST

Nov-05							
Chinook							
Date	Adults	Jacks	Coho	Sockeye	Steelhead Hat	Steelhead Wild	Lamprey
1	11		5		3	5	
2	69		17		4	11	
3	34		2		10	10	1
4	65	1	2		13	4	
5	31	1	1		11	11	
6	26	2	5		12	5	
7	21		1		9	6	
8	5	2	2			2	
9	2	-1	1		1	1	
10	5		2		3	4	
11	5				2	3	
12	3		4		2		
13	1		1			1	
14	11		4		5	5	
15	5		4		2		
16							
17							
18							
19							
20							
21							
22							
23							
24							
25							
26							
27							
28							
29							
30							
31							
Total	294	5	51	0	77	68	1

## Attachment 2. Wells Dam Annual Ladder Counts of Salmon and Steelhead for a 16-hour Daily Count Period (1967-2005)

Year	Chinook Spring	Chinook Summer	Chinook Fall	Chinook Trapped	Total Chinook	Coho	Sockeye	Steelhead	Steelhead Trapped	Total Steelhead	Total Salmonids	Period of Count Inclusive
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
Mean	2,806	9,240	2,481	1,663	16,095	126	33,246	5,654	499	6,156	55,254	
G-mean	2,096	5,959	1,983	1,498	12,645	62	24,465	3,919	474	4,532	46,723	

Note: Chinook counts include jacks.

WDFW counting dates: Spring Chinook, May 1 - June 28; Summer Chinook, June 29 - Aug 28; Fall Chinook, Aug 29 - Nov 15.

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

**Attachment 3. Wells Dam Annual Ladder Counts of Salmon and Steelhead for a 16-hour Daily Count Period (1967-1997)  
and 24-hour Daily Count Period from 1998-2005.**

Year	Chinook Spring	Chinook Summer	Chinook Fall	Chinook Trapped	Total Chinook	Coho	Sockeye	Steelhead	Steelhead Trapped	Total Steelhead	Total Salmonids	Period of Count Inclusive
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
<b>1998</b>	*	4,108	1,200	1,582	6,890	0	4,669	2,984	460	3,444	15,003	5/01-11/15
<b>1999</b>	345	7,787	2,548	938	11,618	224	12,388	3,504	416	3,920	28,150	5/01-11/15
<b>2000</b>	2,587	10,156	3,418	1,327	17,488	0	59,944	6,280	369	6,649	84,081	5/01-11/15
<b>2001</b>	10,871	38,126	9,591	556	59,144	612	74,490	18,528	392	18,920	153,166	5/01-11/15
<b>2002</b>	7,626	62,623	6,472	556	77,277	132	10,768	9,478	373	9,851	98,028	5/01-11/15
<b>2003</b>	4,702	46,391	8,253	556	59,902	168	28,977	9,963	374	10,337	99,384	5/01-11/15
<b>2004</b>	4,793	32,847	5,777	558	43,975	291	78,053	9,317	452	9,769	132,088	5/01-11/15
<b>2005</b>	4,996	31,763	3,461	563	40,783	348	55,559	7,203	417	7,620	104,310	5/01-11/15

Note: Chinook counts include jacks.

WDFW counting dates: Spring Chinook, May 1 - June 28; Summer Chinook, June 29 - Aug 28; Fall Chinook, Aug 29 - Nov 15.

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

## Attachment 4. Wells Dam Daily Water Quality Report, 2005

Apr-05					May-05					Jun-05					Jul-05				
Date	Turbidity	Water Temp (F)	Forebay TDG	Tailwater TDG	Date	Turbidity	Water Temp (F)	Forebay TDG	Tailwater TDG	Date	Turbidity	Water Temp (F)	Forebay TDG	Tailwater TDG	Date	Turbidity	Water Temp (F)	Forebay TDG	Tailwater TDG
1		41	105%	105%	1	9	48	107%	108%	1	9	55	109%	112%	1	14	60	109%	112%
2		41	105%	105%	2	9	48	108%	109%	2	14	55	108%	112%	2	12	61	109%	111%
3			106%	105%	3	9	48	107%	109%	3	10	56	108%	110%	3	15	61	109%	111%
4			105%	105%	4	9	48	107%	109%	4	10	56	109%	113%	4	15	61	109%	110%
5		41	103%	103%	5	9	48	108%	109%	5	10	56	110%		5	15	61	110%	112%
6		42	105%	105%	6	9	49	108%	111%	6	10	55	111%		6	14	60	110%	112%
7		42	106%	107%	7	9	49	107%	109%	7	12	55	110%		7	14	60	110%	112%
8		42	107%	107%	8	9	49	107%	109%	8	12	55	109%	109%	8	14	61	110%	112%
9		43	105%	106%	9	9	49	107%	110%	9	12	55	110%	110%	9	14	61	109%	111%
10		43	105%	105%	10	7	49	106%	108%	10	11	56	109%	110%	10	9	61	110%	112%
11		43	105%	106%	11	9	49	106%	108%	11	11	56	110%	110%	11	10	61	110%	111%
12		43	106%	108%	12	12	50	107%	109%	12	15	57	109%	109%	12	10	61	110%	111%
13		43	105%	107%	13	12	50	107%	109%	13	15	57	109%	109%	13	12	62	110%	111%
14		43	105%	107%	14	12	51	107%	110%	14	15	57	109%	109%	14	12	62	109%	111%
15		43	105%	107%	15	14	51	108%	110%	15	15	57	109%	110%	15	12	62	110%	112%
16		43	106%	107%	16	14	51	108%	110%	16	14	57	110%	112%	16	14	62	110%	111%
17		43	105%	107%	17	14	51	107%	109%	17	14	57			17	11	62	110%	111%
18		43	105%	106%	18	14	51	107%	110%	18	13	57			18	11	63	110%	114%
19		44	106%	108%	19	14	51	106%	108%	19	14	58			19	7	63	111%	113%
20		44	106%	108%	20	8	51	105%	107%	20	15	59			20	10	63	111%	112%
21		45	106%	108%	21	8	51	105%	107%	21	15	59	110%	112%	21	10	63	110%	112%
22		45	108%	109%	22	13	52	106%	108%	22	15	59	110%	111%	22	13	63	111%	112%
23		46	108%	109%	23	14	52	106%	110%	23	15	59	109%	110%	23	11	63	109%	111%
24		46	108%	109%	24	13	52	106%	109%	24	15	59	110%	111%	24	14	63	109%	111%
25		47	107%	109%	25	14	53	107%	112%	25	15	59	110%	111%	25	11	64	109%	111%
26		47	107%	109%	26	14	53	108%	114%	26	14	59	111%	112%	26	11	64	109%	111%
27		47	107%	109%	27	10	53	108%	117%	27	15	59	109%	111%	27	11	64	110%	112%
28		48	107%	109%	28	14	54	109%	110%	28	13	59	109%	110%	28	11	64	110%	112%
29		48	107%	108%	29	11	55	111%	111%	29	13	59	109%	111%	29	11	64	110%	111%
30		47	106%	108%	30	11	56	110%	111%	30	15	60	109%	111%	30	11	65	109%	110%
					31	10	56	109%	111%						31	13	65	109%	110%
<b>Avg</b>		<b>44</b>	<b>106%</b>	<b>107%</b>	<b>Avg</b>	<b>11</b>	<b>51</b>	<b>107%</b>	<b>110%</b>	<b>Avg</b>	<b>13</b>	<b>57</b>	<b>109%</b>	<b>111%</b>	<b>Avg</b>	<b>12</b>	<b>62</b>	<b>110%</b>	<b>111%</b>

**Attachment 4. Wells Dam Daily Water Quality Report, 2005 (continued)**

Aug-05					Sep-05					Oct-05					Nov-05				
Date	Turbidity	Water Temp (F)	Forebay TDG	Tailwater TDG	Date	Turbidity	Water Temp (F)	Forebay TDG	Tailwater TDG	Date	Turbidity	Water Temp (F)	Forebay TDG	Tailwater TDG	Date	Turbidity	Water Temp (F)	Forebay TDG	Tailwater TDG
1	15	65	109%	110%	1	12	68	105%	108%	1	14	65			1	14	59		
2	15	65	108%	109%	2	12	68	104%	105%	2	14	65			2	14	59		
3	15	65	108%	109%	3	12	68	104%	104%	3	14	64			3	13	58		
4	15	65	108%	110%	4	14	67	103%	104%	4	14	64			4	14	58		
5	15	65	108%	110%	5	14	67	103%	103%	5	14	64			5	7	58		
6	15	65	109%	111%	6	14	67	103%	104%	6	14	64			6	14	57		
7	15	65	108%	110%	7	14	67	104%	104%	7	14	64			7	14	57		
8	15	66	109%	111%	8	14	67	103%	105%	8	14	64			8	14	56		
9	15	66	109%	111%	9	12	67	102%	104%	9	13	64			9	14	56		
10	15	66	109%	111%	10	14	67	103%	105%	10	13	64			10	14	56		
11	15	66	108%	110%	11	14	66	102%	105%	11	12	64			11	14	56		
12	15	67	108%	110%	12	13	66	102%	104%	12	13	64			12	14	56		
13	15	67	107%	108%	13	15	67	102%	104%	13	13	63			13	14	55		
14	14	67	108%	109%	14	15	67	101%	103%	14	14	63			14	14	55		
15	14	67	108%	109%	15	7	67			15	14	63			15	14	55		
16	15	67	107%	109%	16	14	67			16	7	63			16		55		
17	14	67	107%	109%	17	14	67			17	14	63			17		55		
18	15	67	106%	108%	18	13	67			18	14	63			18		54		
19	15	67	106%	108%	19	13	67			19	14	63			19		54		
20	15	67	106%	108%	20	13	67			20	14	62			20		54		
21	14	67	106%	108%	21	14	66			21	14	62			21		54		
22	14	67	106%	109%	22	14	66			22	14	62			22		54		
23	14	67	105%	107%	23	13	66			23	14	62			23		54		
24	15	67	104%	106%	24	13	66			24	14	62			24		53		
25	15	67	105%	107%	25	14	66			25	14	61			25		53		
26	15	67	105%	108%	26	14	65			26	15	61			26		52		
27	15	67	106%	107%	27	14	65			27	14	60			27		52		
28	15	67	106%	106%	28	14	65			28	14	60			28		52		
29	14	67	105%	105%	29	14	65			29	14	60			29		52		
30	14	67	104%	104%	30	14	65			30	14	60			30		51		
31	14	67	104%	105%	31	14	65			31	14	59							
<b>Avg</b>	<b>15</b>	<b>66</b>	<b>107%</b>	<b>108%</b>	<b>Avg</b>	<b>13</b>	<b>67</b>	<b>103%</b>	<b>104%</b>	<b>Avg</b>	<b>14</b>	<b>63</b>			<b>Avg</b>	<b>13</b>	<b>55</b>		