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MONITORING OF DOWNSTREAM SALMON AND STEELHEAD AT AT FEDERAL HYDROELECTRIC FACILITIES

Annual Report 2000

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Bonneville Power Administration
Environment, Fish and Wildlife Division
P.O. Box 3621
905 N.E. 11th Avenue
Portland, OR 97208-3621

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MONITORING OF DOWNSTREAM SALMON AND STEELHEAD AT FEDERAL HYDROELECTRIC FACILITIES - 2000 Annual Report

Prepared By
Rick D. Martinson
Jeffrey W. Kamps
Gregory M. Kovalchuk
Dean Ballinger

Pacific States Marine Fisheries Commission
45 S.E. 82nd Drive, Suite 100
Gladstone, Oregon 97027-2522

Prepared For
Department of Energy
Bonneville Power Administration
Division of Fish and Wildlife
P.O. Box 3621
Portland, Oregon 97208

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Abstract.— 2000 was the third season in the Smolt Monitoring Facility (SMF) at John Day Dam. Despite the continued presence of the NMFS The Dalles Dam spillway survival study, and a higher target number of study fish, sample numbers were down form 1999. Additionally, the average sample rate this year (25%) was nearly twice the average rate in 1999, (13%). Spill, expressed as a percent of river flow, was up slightly this year, about 3% in the spring and 8% through the summer and fall, which accounts for some of the decline in sample numbers. The largest declines in sample numbers were for yearling and subyearling chinook and wild sockeye. Descaling and mortality rates were very low for all species, the highest descaling was 11.2% for hatchery sockeye. River flow was lower than last year, debris was light, dissolved gas levels were generally below the Oregon and Washington water quality standards, and overall, migration conditions were good. Passage duration was generally similar to last year but timing varied considerably, depending on species. PIT tag detections were down to 41,848 from 138,705 the previous year. Increased spill passage is the likely explanation for the large decline. The Separation by Code component of the system was utilized by three different studies.

At Bonneville Dam, index level sampling was transferred from the first powerhouse to the second powerhouse and occurred at the new Hamilton Island Juvenile Monitoring Facility. An estimated 2.7 million fish passed through the bypass system, 54,051 of which were sampled in the new facility. The location and method differ so much from previous years that comparisons are pointless. River conditions were similar to those described for John Day Dam; lower than in 1999, moderate debris, manageable gas levels, and normal temperatures. Passage timing and duration was very similar to last year for the chinook and steelhead but the coho migration started later and ended earlier, and sockeye were just the opposite. Descaling rates were up for all species and mortality was up for yearling and subyearling chinook and coho. PIT tag detection declined from 130,998 last year to 86,842 this year.

PREFACE

Project 84-014 has been part of the annual integrated and coordinated Columbia River Basin Smolt Monitoring Program since 1984, and currently addresses measure 5.9A.1 of the 1994 Northwest Power Planning Council's (NPPC) Fish and Wildlife Program. The program is coordinated by the Fish Passage Center and funded by the Bonneville Power Administration. This National Marine Fisheries Service (NMFS) project was established to: 1) collect and report daily fish capture, fish condition, dam operations, and river flow data to water managers to improve the scientific information on which to base in–season operations of the hydro system, and 2) analyze the collected data and characterize juvenile fish passage at main stem federal dams and transfer this information, learning, and understanding to the fisheries community through technical reports and publications. In the 1980s, this project conducted the smolt monitoring at Lower Granite, Lower Monumental, McNary, John Day, and Bonneville dams. Since the early 1990s, the smolt monitoring at the Snake River dams and McNary Dam has been assumed by non-federal entities, mainly the states of Washington and Oregon, and this project has performed the smolt monitoring at John Day, The Dalles (1989 – 1991), and Bonneville dams.

In 1999 the contract for project 84-014, which was the remaining federal portion of the Smolt Monitoring Program (SMP), was not renewed. The work previously done under this contract was combined with the non-federal portion of the SMP, project 87-127. This consolidation was done to facilitate review and reduce administrative costs.

The following report presents results from the 2000 smolt monitoring season at John Day and Bonneville dams and represents the seventeenth annual report for SMP activities at these two sites. The report also contains summaries of data for all years of the program at John Day and Bonneville dams in Appendices C and D.

INTRODUCTION

The seaward migration of juvenile salmonids was monitored by the Pacific States Marine Fisheries Commission (PSMFC) at John Day Dam, located at river mile 216, and at Bonneville Dam, located at river mile 145 on the Columbia River (Figure 1). The PSMFC Smolt Monitoring Project is part of a larger Smolt Monitoring Program (SMP) coordinated by the Fish Passage Center (FPC) for the Columbia Basin Fish and Wildlife Authority. This program is carried out under the auspices of the Northwest Power Planning Council's Fish and Wildlife Program and is funded by the Bonneville Power Administration.

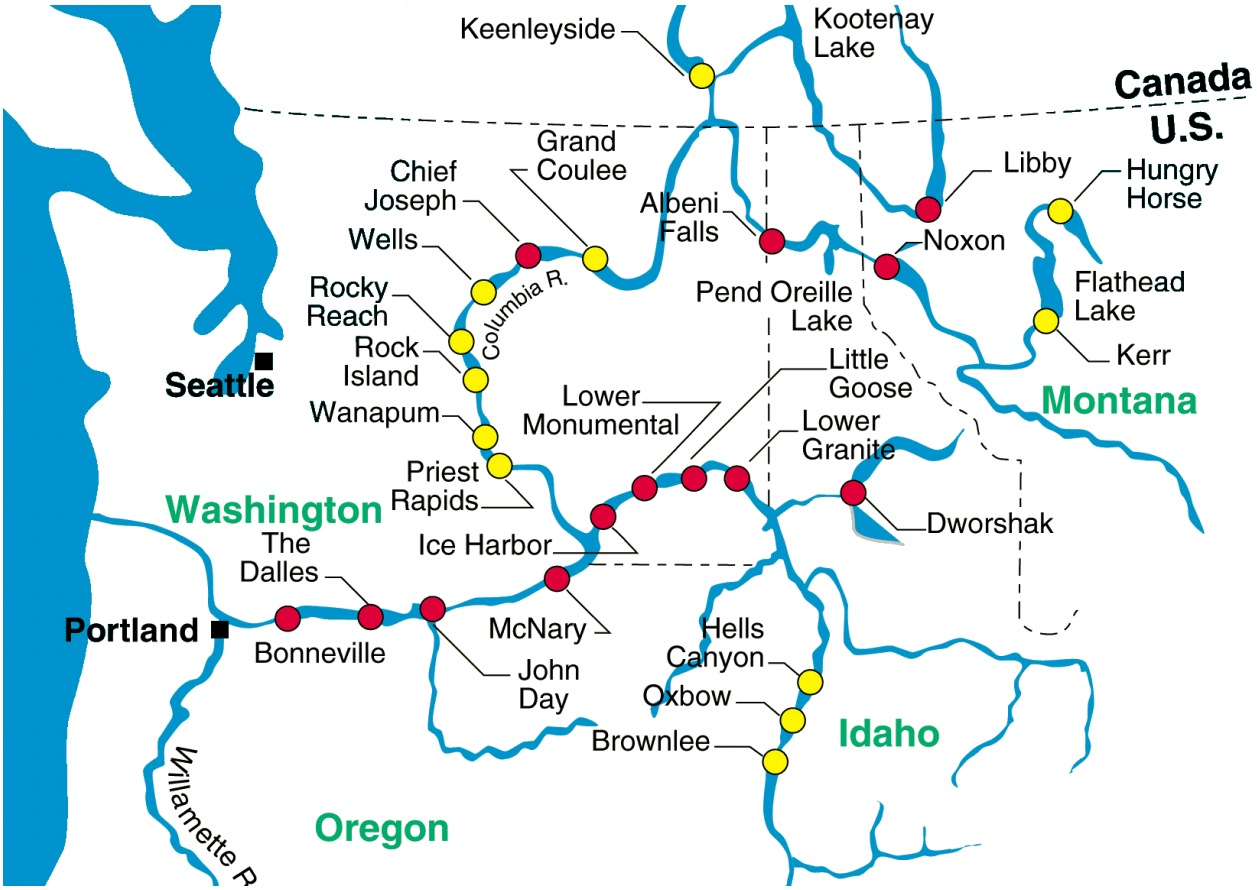

Figure 1. Hydroelectric projects on the Snake and Columbia Rivers. This figure is reprinted courtesy of the U.S. Army Corps of Engineers, Portland District.

The purpose of the SMP is to monitor the timing and magnitude of the juvenile salmonid out-migration in the Columbia basin and make flow and spill recommendations designed to facilitate fish passage. Data are also used for travel time and survival estimates and to build a time series data set for future reference. The purpose of the PSMFC portion of the program is to provide the FPC with species and project specific real time data from John Day and Bonneville dams.

METHODS AND MATERIALS

JOHN DAY DAM

Sampling

In 2000, the third year of sampling in the Smolt Monitoring Facility at John Day, sampling commenced on 3 April and ended on 18 September. The sample day extended from 0700 to 0700 as it did last year. Samples were collected

daily and each sample day was divided into several sample periods. Fish were collected and sampled from 0700 to 1400, and from 1400 to 2000. Fish that were sampled during 2000-0300 were processed hourly during research collection periods. This was done to reduce delay of actively migrating smolts during peak passage hours and to accommodate the research fish collection needs. Fish collected after 0300 were sampled in the morning at 0700, which completed the daily sample. The combination of all of the sample periods comprised the daily count.

During the spring, with more species present, the target sample size range was 500 - 750 fish per day. During the summer/fall migration, with mainly just subyearling chinook present, the target sample range was 200 - 300 fish per day. Sample rates were adjusted as needed to achieve these target sample sizes or to collect more fish for research. Timed subsamples are collected using a 3-way rotational gate. When the gate rotates left (west), all fish are diverted into the sample holding tank. The center flume is the bypass-to-river flume and is the default. The 3-way gate can be programmed to collect specific PIT tagged fish detected in the coils just upstream, and divert them into the PIT tag flume with a rotation to the right (east). This feature is referred to as Separation by Code (S by C). This system is capable of further separation of the fish in the PIT tag flume using a 2-way rotational gate to divert fish into one of two holding tanks (Figure E-2).

Fish were collected in a 6,796 liter (1,795 gal) holding tank located inside of the sampling lab. At the end of a sample period, the crowder was moved forward and the next sample was collected behind it. Approximately 50 - 75 smolt were then crowded into a 20 by 24-inch pre-anesthetic (PA) chamber using a panel net. The water level in the PA chamber was lowered to about 8 inches (48 liters) and fish were anesthetized with MS-222 at a concentration of about 51 mg/L. Once anesthetized, fish were gravity fed via a 6 inch PVC pipe onto a final dewatering screen and into the examination trough that contained about 36 mg/L of MS-222 to minimize stress during examination. A re-circulating system was used to minimize MS-222 usage and a chiller kept examination trough water temperature consistent with river water temperature. New in the lab for 2000, an in-line water filtration system was installed to minimize the possibility of inadvertently culturing and spreading pathogens (viruses, bacteria, and fungus) in the re-circulating examination water. Three Rainbow Plastics UV Sterilizer filters (40 watt), a Venturi Protein skimmer, and two sets of particulate bag filters (100 and 20 micron) were installed in-line with the existing re-circulation system. The bag filters were installed in parallel so that one set could be cleaned without shutting the system off. These were switched and cleaned daily or as needed. Following examination, all sampled fish were gravity fed via a 4 inch PVC pipe to a 2,726 liter (720 gal) recovery tank and held for a minimum of twenty minutes before being returned to the bypass system. This process was repeated until the entire sample had been examined. All holding and recovery tanks had a constant exchange of river water. Diagrams showing the footprint of the facility and the schematic of the lab are presented in Figures E-1and E-2, respectively. Much of the data presented in Appendix C was collected with an airlift pump system. For an explanation of this system, see previous reports. For a diagram, see Figure E-3.

BONNEVILLE DAM

Sampling - Second Powerhouse

Due to the completion of the new Hamilton Island Juvenile Monitoring Facility (JMF), and the fact that only second powerhouse (PH2) guided fish were routed to the new facility, “Index” level (see Definition of Terms for explanation) sampling was shifted from the first powerhouse (PH1) to PH2. Sampling began at 0700 hours on 7 March and concluded at 0700 on 31 October. The sample rate was programmed to divert samples on an hourly basis with sample time split into 2, 4, or 6 subsamples of equal duration per hour depending on passage numbers and run timing. Fish collected at different sample rates were processed separately. During the spring migration, when species diversity is greatest, the target sample size was 500 – 750 fish per day. During the summer/fall migration, with mainly subyearling chinook present, the target sample was 200 - 300 fish per day.

Fish that are guided by the PH2 bypass system travel the 1.7-mile conveyance pipe to get to the new JMF. A switchgate at the exit of the pipe directs fish to either the sampling facility or directly back to the river. In the sample position, the 30 cfs in the flume flows into the Primary Dewatering Structure (PDS) where it is reduced to about .5 – 1 cfs that then empties onto a set of parallel bars called the “large fish and debris separator bars”. The purpose of these bars is to separate the juveniles, which slide through the bars, from the large fish and debris, which slide across the bars and are routed back to the river. As fish exit the “hopper” area under the separator bars, they travel down a flume toward the first set of PIT tag coils. These coils can be used to activate the 3-way rotational gate to divert fish with specific PIT tag codes into one of two holding tanks in the basement of the facility. This is

the Separation by Code (SbyC) system. Just downstream of the 3-way rotational gate on the default or center flume is the 2-way rotational gate. The 2-way gate is used exclusively to collect timed subsamples for smolt monitoring. Collected fish are routed to an 18,930-liter (5,000 gallon) holding tank in the basement. This system differs from John Day where the 3-way gate is used for initial S by C and SMP sample collection, the 2-way gate, which is on the S by C flume, is used for subdivision of S by C fish.

All of the holding tanks are equipped with crowders used to separate fish collected on one sample day from the next, or fish collected at different sample rates. The crowders are also used to crowd fish to the "fish lift" end of the holding tanks. Because the JMF is so far from the powerhouse, head loss made it necessary to put the holding area in the basement of the JMF. Since the processing area is on the main floor, it was necessary to use fish lifts to get fish upstairs. In the bottom of the fish lifts are 24 by 27-inch pre-anesthetic (PA) chambers. Approximately 50 - 75 smolt are crowded into the PA chamber, water is lowered to about 10 inches (104 liters), and fish are anesthetized with MS-222 at a concentration of about 51 mg/L. Once raised, fish are released from the PA compartment into a 20' piece of 6" PVC pipe which leads to the sorting trough. Fish pass through a final dewatering device before arriving in the examination trough. The exam trough contains about 42 mg/L of MS-222 to keep fish anesthetized during examination. Following examination, fish were gravity fed via a 4 inch PVC pipe to a recovery tank and held for a minimum of thirty minutes before being released. Fish pass through one more set of PIT tag coils before returning to the bypass flume. Downstream of where they enter the bypass flume is another switch gate, which directs the flow to either the high water or low water outfall. The system switches from one outfall to the other when the river elevation at the outfall is around 17 feet.

PH2 Diagrams showing the footprint of the facility and the schematic of the lab are presented in Figures E-9 and E-10, respectively. Please see Krcma et al. 1984 for a description of the system used prior to 1997. For a description of the system used in 1997 and 1998 see the 1998 report for this project, Martinson, et. al. 1998, and for diagrams of the system see Figures E-7 and E-8. Figure E-6 shows the fish processing area of the second powerhouse used through 1998.

First Powerhouse

With the indexing emphasis placed on PH2, sampling in PH1 was reduced to two days per week for condition monitoring and gas bubble exams. Fish samples were collected from the bypass channel of the first powerhouse using the downstream migrant trap. Gessel (1986) described the trap operation and a cross sectional diagram of it can be seen in Figure E-4. Sampling occurred between 1600 and 2400 hours on Monday and Thursday for condition monitoring and Gas Bubble Trauma (GBT) exams. On Saturdays, only condition monitoring was conducted. Research fish collection occurred on various days. The sample effort was adjusted from 30 seconds to 15 minutes per set, depending upon passage numbers and run timing. Typically, 15 to 25 fish per set were optimal for condition and GBT monitoring, while 50 to 100 fish per set were targeted for research fish collection. Samples were collected by lowering a wedge wire screen into the bypass channel at the end of the inclined screen, diverting fish into a 2,415-liter (638 gal) tank suspended in the downwell (Figure E-4). Collected fish were drained from the tank to a stainless steel holding tank via a rectangular chute. From there, about 15 to 50 fish at a time were crowded into a PA chamber and anesthetized with MS-222 at a concentration of about 51 mg/l. Once anesthetized, fish were net transferred from the holding tank to the sorting trough. The sorting trough contained about 42 mg/l of MS-222 to minimize stress during handling. After processing, sampled fish were scanned for PIT tags before going to a recovery tank. Fish were allowed to recover for at least 30 minutes before releasing them into the downwell via a 6-inch PVC pipe (Figure E-5).

Flat Plate Operation

The flat plate was operated 24 hours per day from 3 April through 8 September and was reconfigured this season to detect ISO PIT-tags. The primary differences between the ISO system and the previous system are: 1) 134.2 kHz frequency replacing the 400kHz frequency, 2) One antenna to transmit and receive versus separate transmitter and receiver antennas and, 3) Four detection coils instead of two. Conversion to the ISO system provides improved read rates and ranges. Also this year, a second pneumatic cylinder used to raise and lower the flat plate was added. This was done to eliminate wobbling which was stressing the structural frame of the system. Between samples, the flat plate was lowered onto the tank and the tank was lowered to sampling position. When the screen was lowered, fish passing over the flat plate were scanned for PIT tags. For sample collection, the flat plate was raised and fish were

diverted into the collection tank.

Gas Bubble Trauma Subsampling

From 3 April through 31 August, up to 200 fish per day were examined for the presence of gas bubbles. Examinations were performed on 100 steelhead and 100 of the most abundant chinook, yearling or subyearling, twice weekly on Mondays and Thursdays. Examinations were performed on unpaired fins, eyes, and the lateral line using a variable power magnification (6X to 40X) dissecting microscope. Bubbles were quantified as the "percent of the lateral line occluded" or, on fins, "percent of surface area covered" and assigned a severity ranking. If occlusion was less than 5%, a rank of 1 was assigned. A rank of 2 was used for the 6% - 25% range, rank 3 for the 26% - 50%, and a rank 4 for greater than 50%.

JOHN DAY AND BONNEVILLE

Subsampled Fish Condition

Detailed fish condition monitoring was performed on a target sample size of 100 individuals per species, three days per week. Steelhead and sockeye were examined Tuesday, Thursday, and Saturday, whereas chinook and coho were examined Monday, Wednesday, and Friday. The sample crews attempted to choose fish at random and to select fish throughout the sample day. In addition to fin clips and marks (brands or tags), smolts were examined for descaling, injuries to the head and body, parasites, disease, and signs of predation. Fork lengths were also recorded so that length averages could be calculated for all subsampled fish. At John Day, condition data was collected on yearling chinook, steelhead, coho, and sockeye from 9 April to 12 June and subyearling chinook were examined from 12 June to 1 October. Bonneville condition data was collected on yearling chinook, steelhead, coho, and sockeye from 16 March to 24 June and subyearling chinook were examined from 11 June to 10 September.

Performance Monitoring

Tests to evaluate species identification, brand recognition, descaling assessment, and data recording accuracy of SMP personnel were conducted during the migration season. A subsample of ten fish were randomly selected, anesthetized, and placed into a compartmentalized divider located in the sorting trough. Fish were processed independently and specific details were recorded for each fish including: 1) species, 2) fin clip, 3) level of descaling, and 4) presence of external marks or tags. Coworkers then compared and discussed results. This approach has several advantages over previously used methods, including: 1) increased frequency of tests, 2) up to three people are able to test concurrently, 3) promotes teamwork and builds consistency between coworkers, and most importantly, 4) the ability to discuss discrepancies with fish in hand.

Data Collected

Items 1-5 of the following list were reported to the Fish Passage Center daily; item 6, the PIT tag data, was automatically uploaded to the PTAGIS data center four times per day.

1) Species specific daily sample totals
2) Brands and fin clips
3) Descaling and mortality
4) Species specific length and condition data (subsampling only)
5) River, powerhouse, turbine, and spill flow data
6) PIT tag detection

DEFINITION OF TERMS

Three types of numbers are discussed in the report, defined as follows:

1) Total Sample: actual fish counts, number of fish handled.

2) Estimated Collection: total sample number divided by sample rate, resulting in an estimated number of fish passing through collection system.

3) Fish Passage Indices: estimated collection counts divided by the proportion of total river flow passing through the sample system resulting in a relative indicator of fish abundance with no adjustment for

Fish Guidance Efficiency, horizontal, vertical or temporal fish distribution.

As stated in the Fish Passage Center Annual Reports, Fish Passage Indices (FPI) are used as relative indicators of population abundance, and assumes that fish pass through spill and powerhouse units in numbers proportional to the flow through those passage routes. Indices are not estimates of total daily passage, but rather a relative measure of how the migration is progressing over the season for a given species.

Hourly FPI's are no longer calculated at either site. However, in the past, both sites did generate hourly and daily indices, and these numbers are still listed in some of the historical tables in Appendices C and D. Therefore, definitions for Hourly and Daily FPI's are retained, they are defined as follows:

Hourly Resolution FPI divides hourly collection counts by the proportion of river flow through the sampled unit or powerhouse for that hour, then sums hourly subtotals to get the daily total. There is no expansion for 8 hour monitoring at Bonneville.

Daily Resolution FPI divides daily collection counts by the proportion of daily average river flow through the sampled unit (JDA) or powerhouse (BO1) for the day.

RESULTS AND DISCUSSIONS

JOHN DAY DAM

Included in this year's report are program summary tables. See Table C-12 for a summary of all years of sampling, including sample dates, sampling effort, sample, collection, and index numbers.

The Numbers

Sample Numbers

The total number of fish handled at John Day in 2000 was 479,747 (Table 1), about 85.6% of the 1999 total of 560,708. Species specific sample numbers expressed as a percent of 1999 sample numbers are as follows: coho, 152%; wild steelhead, 132.4; hatchery steelhead, 91.6; subyearling chinook, 85%; yearling chinook, 77.8%; wild sockeye, 31%; and hatchery sockeye, 27%. See Table 1 for the actual numbers and Table C-12 for a comparison to previous years. The decline in actual sample numbers is compounded by the fact that it took nearly double the effort to get that reduced sample size. The average sample rate in 1999 was 13% but in 2000, it was 25%. We also had a shorter sampling season this year, ending on 18 September instead of 26 October, but this likely had little effect since we traditionally only caught 2 – 3 % of the season total that time of year. There were about 1.5 million more fish transported this year, which may explain some of the difference. The rest of the difference is either fewer smolts migrating this year or a larger number of the migrating smolts went over the spillway. Average daily spill (as a percent of total river) averaged about 3% more during the spring and 8% more during the summer/fall period this year which may account for some of the decline in sample numbers.

The species composition, expressed as a percent of all the fish sampled, was higher this year than last year for coho, 12% versus 6.8%; unclipped steelhead, 9.3% versus 6%; and clipped steelhead, 8% versus 7.5%. It was lower for subyearling chinook, 41.1% versus 41.4%; yearling chinook, 26% versus 28.6%; and sockeye, 3.5% versus 9.8%.

Collection Estimates

The total collection estimate of 2,296,519 is about 36% of the 1999 collection estimate of 6,370,374. Decreases ranged from 7% for hatchery sockeye to 63% for wild steelhead. Collection estimates for the remaining species, expressed as a percent of last year, are as follows: coho, 44%; subyearling chinook, 37%; yearling chinook, 36%; hatchery steelhead, 31%; and wild sockeye, 10%.

Fish Passage Indices

Collection numbers are divided by the proportion of river flow through the sample unit to get a Fish Passage Index (FPI). The 2000 index total for all species combined was 3,353,359, about 39% of the 1999 FPI of 8,512,862. The possible explanations for such a large decrease are the same as those listed in the sample numbers section. A breakdown by species for sample, collection, and index numbers can be found in Table 1 and a comparison of 2000 numbers to all previous years can be found in Table C-12. For more information on collection and index estimates see the Fish Passage Center Annual Report.

Table 1. Summary of 2000 smolt monitoring at John Day and Bonneville dams.

Species	Site	Sample		Collection[1]		FPI[2]	Descaling[3]		Mortality[4]	
		Number	Percent Comp.	Number	Percent Comp.		#	%	#	%
Yearling Chinook	John Day	124,788	26.0	579,810	25.2	827,046	3,001	2.4	289	0.23
	Bonneville PH #1	5104	28.4				471	9.3	30	0.59
	Bonneville PH #2	17,337	32.1	809,700	29.0	2,539,355	576	3.3	80	0.46
Subyearling Chinook	John Day	197,340	41.1	1,132,204	49.3	1,680,656	1,102	0.6	186	0.09
	Bonneville PH #1	7477	41.7				253	3.4	77	1.03
	Bonneville PH #2	19,664	36.4	1,130,109	40.5	3,814,964	101	0.5	68	0.35
Unclipped Steelhead	John Day	44,416	9.3	188,601	8.2	271,975	789	1.8	26	0.06
	Bonneville PH #1	1314	7.3				104	7.9	0	-
	Bonneville PH #2	2,208	4.1	89,961	3.2	277,538	57	2.6	3	0.14
Clipped Steelhead	John Day	38,475	8.0	182,036	7.9	250,020	2,159	5.6	44	0.11
	Bonneville PH #1	1378	7.7				173	12.6	1	0.07
	Bonneville PH #2	2,839	5.3	121,745	4.4	380,008	143	5.0	7	0.25
Coho	John Day	57,716	12.0	172,742	7.5	263,722	819	1.4	59	0.10
	Bonneville PH #1	2,452	13.7				101	4.2	22	0.90
	Bonneville PH #2	11,596	21.5	619,676	22.2	1,977,601	182	1.6	33	0.28
Unclipped Sockeye	John Day	16,608	3.5	40,000	1.7	58,325	235	1.4	16	0.10
	Bonneville PH #1	167	0.9				38	23.0	2	1.20
	Bonneville PH #2	363	0.7	18,357	0.7	59,044	34	9.4	3	0.83
Clipped Sockeye	John Day	404	0.1	1,126	0.0	1,616	45	11.2	2	0.50
	Bonneville PH #1	56	0.3				13	23.2	0	-
	Bonneville PH #2	44	0.1	1,360	0.0	6,448	1	2.3	0	-
SEASON TOTALS	John Day	479,747		2,296,519		3,353,359	8,150	1.7	622	0.13
	Bonneville PH #1	17,948		-		-	1,153	6.5	132	0.74
	Bonneville PH #2	54,070		2,790,908		9,054,957	1,094	2.0	194	0.36

River Conditions

River Flow

Throughout the juvenile out migration, river flow was lower in 2000 than in 1999. The 2000 spring (April & May) river flow averaged 268.6 kcfs, slightly lower than the 275.9 kcfs for the same period last year. The spring peak flow of 361.9 kcfs occurred on 24 April and was about 20 kcfs smaller than last years 28 May peak of 380.8 kcfs. In 1999, flows were above 300 kcfs for all of June, averaging 343.7 kcfs for the month. This year, June flows averaged only 208 kcfs. For the summer migration period, June and July, the average river flow of 185.8 kcfs was about 100 kcfs less than for the same period last year. In August, flows continued to decline averaging just 130.5 kcfs from August through the end of the season compared to an average of 171.7 kcfs last year (Figure 3).

[1] Collection numbers are sample numbers divided by sample rate.

[2] FPI (Fish Passage Index) is collection divided by the proportion of daily average river flow through the powerhouse.

[3] Descaling numbers are based on sample numbers minus mortality numbers.

[4] Mortality numbers are based on sample numbers.

Spill and Dissolved Gas

Spill, expressed as a percent of total river flow, averaged 25% in April and May (spill for juvenile migration began 17 April) compared to 22% for the same period last year. Throughout the rest of the spill program, June, July, and August, spill averaged 35% of river flow, 8% more than for the same period last year. The Fish Passage Plan calls for spill to be 60% of river flow from 20 April to 31 August when total river flow is less than 300 kcfs, excluding special conditions for research.

For April and May, percent gas saturation in the John Day tailrace averaged 114.6% and peaked at 122.1%. This compares to an average of 113.4% last year. For the rest of the spill program, June through August, percent saturation in the tailrace averaged 113.4%, which is lower than the 117.9% for the same period in 1999. These levels of spill enabled the total dissolved gas limits imposed by the Washington and Oregon water quality departments to generally be maintained. For more detail on dissolved gas levels and monitoring results, see the Fish Passage Center annual report.

Temperature

Spring water temperature in the fish handling facility ranged from 48.3^0F to 59.6^0F and averaged 53.3^0F, a couple degrees warmer than last years average of 51.5^0 F for the same period. During June and July the range was 58.5^0F to 71^0F with an average of 64.8^0F, almost 3 degrees warmer than the same period last year. In August and September, the range was 66.2^0F to 72.1^0F, with an average of 69.3^0 F. The highest temperature of the year was 72.1^0 F recorded on 4 August.

Passage Patterns

Yearling Chinook passage this year was nearly identical to last years in timing and duration (Figure 2). The 10% passage date was early, relative to last year and all previous years. In fact, it was the second earliest, tied with 1997 and just one day behind the earliest date recorded back in 1986 (Table C-2, Figure C-2). As usual, passage was highest during the first 3 weeks of May (Figure 3) with the first and biggest single day peak of 4% of total occurring on 2 May, a little more than 2 weeks ahead of the historical median peak (Figure C-1).

Subyearling Chinook passage returned to a more "normal" passage pattern this year, going from a middle 80% duration of 38 days last year to 59 this year, which is much closer to the historical median of 66 days (Figure 2). Passage started earlier this year, reaching the 10% passage point earlier than all previous years except 1997 (Table C-2, Figure C-2). Passage was quite "spiky" this year, with the first significant spike on 6 June (5%) with several smaller spikes throughout the season. The biggest passage spike was about 7% of the season total passage and occurred on 29 June (Figure 3 and Figure C-1).

Unclipped Steelhead passage duration for the middle 80% was the same as in 1999, 41 days, but the timing was quite different. The 10%, 50%, and 90% passage dates were all shifted forward by about one week (Figure 2). This was mostly the result of an early 10% passage date of 18 April, the earliest ever recorded (Table C-2, Figure C-2). Significant passage, averaging about 2% of total per day, occurred from the first of April through the first week of June, (Figure 3). This pattern is very similar to that that seen in the past as represented by the historical average pattern shown in Figure C-1.

Clipped Steelhead passage was very similar to unclipped steelhead passage in that the 10% passage date was earlier than last year or any previous year (Figure 2 and Figure C-2). Also, the overall duration in days for the middle 80% to pass John Day was the same as last year (40 days) and very similar to unclipped steelhead (41days). The 50% passage point was 2 days earlier than the 10% date for the historical median. The very early 10% passage date is mostly due to a large passage spike on 15 April of 6% of total index. Passage spiked again on 2 May at about 5% then tapered off the rest of the season (Figure 3). The shifting of the clipped steelhead forward in time as compared to the historical median is obvious in Figure C-1.

Coho was the only species this year that had a 10% passage date later than last years. The 90% passage date was also later which produced a middle 80% duration one day longer than last years, 35 days versus 34 days, respectively (Figure 2). Both years had extended migration periods compared to the historical median, which is 26 days. Coho passage was marked by a single large passage spike of almost 9% of the total index on 8 May (Figure

3). Coho passage has historically shown a lot of variation in daily passage magnitude (Figure C-1) and middle 80% duration (Figure C-2).

Sockeye passage also set some records this year. The earliest 10% passage date, the longest middle 80% duration, and the second latest 90% passage date (Figure 2, Table C-2, and Figure C-2). Daily passage was significant from mid April through the first of June, with several small passage spikes into the first of August. Again, the earlier passage of sockeye compared to the historical median is presented in Figure C-1.

The net result is about what you would expect for a "lower" flow year, longer migration duration periods for the middle 80% of the migrants for all species except subyearling chinook. They ranged from 3 days longer for yearling chinook to 16 days longer for clipped steelhead (Table C-2).

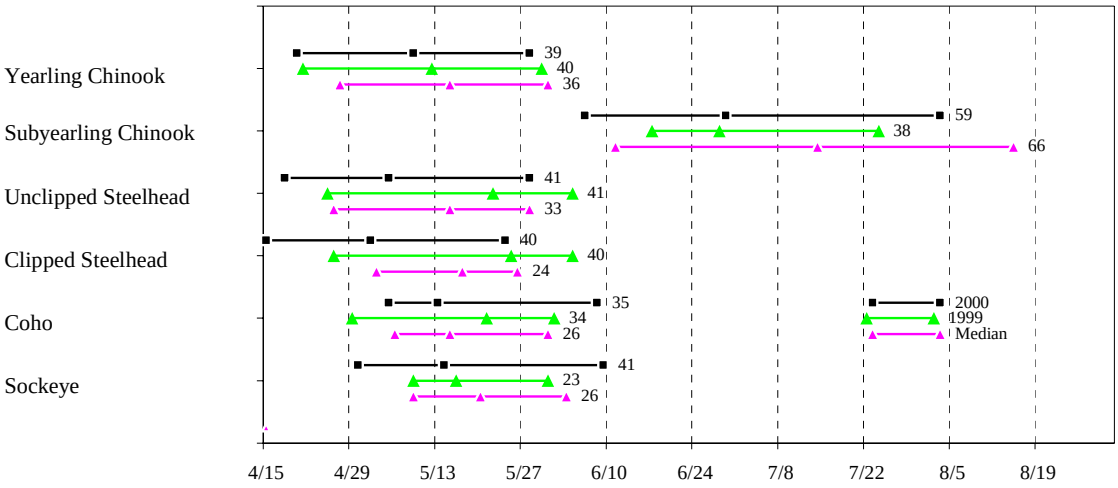

Figure 2. 10%, 50%, and 90% passage dates and the historical median at John Day Dam, 2000. The duration (in days) between the 10% and 90% passage dates is indicated for each line.

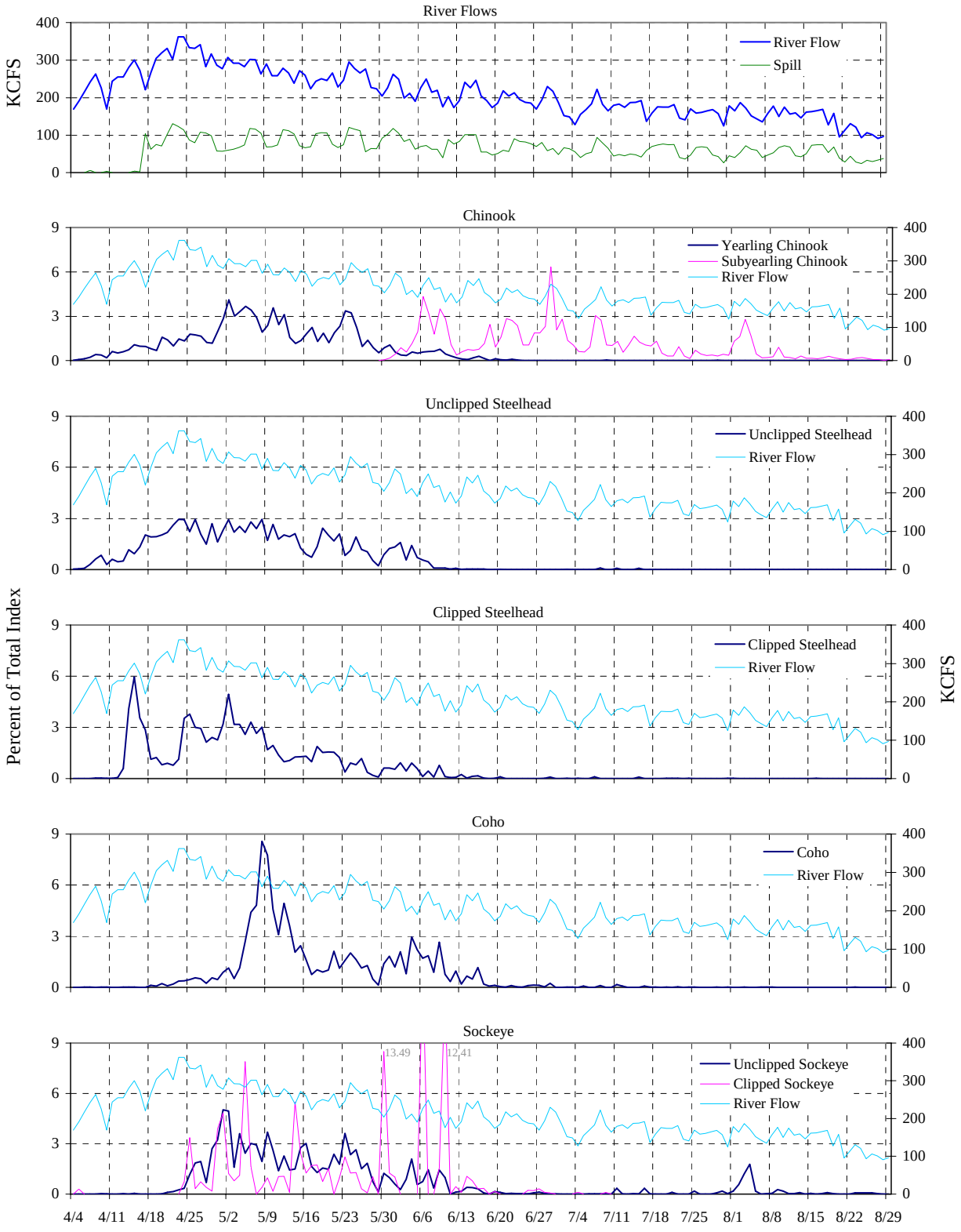

Figure 3. Seasonal passage patterns and daily average river flows for John Day Dam, 2000.

Diel

With the relocation of sampling to the new smolt monitoring facility in 1998, the collection of the hourly passage detail was discontinued. However, the diel data collected between 1985 and 1997 is presented several ways in Appendix C. Table C-1 presents the total percent of night passage by species for each year. Figure C-3 is a graphical presentation of the diel pattern for all years, averaged and presented with standard deviation for each hour. Figure C-4 shows the percent of night passage as a bar graph for each year and species, with the average for each species shown as a line. Table C-3 shows the percent of total passage each year by hour for each species.

Fish Condition

Overall, descaling at John Day Dam in 2000 was very low for all species (Figure 4). Flows and corresponding debris loads were low to moderate all season and overall fish condition was excellent.

Yearling Chinook descaling, at 2.4%, was the lowest ever recorded at John Day (Table C-4). It is less than half the rate of the last two years and less than a third of the 1985-1997 average when samples were collected with the airlift pump system (see Methods section) (Figure 4, Table C-4, Figure C-5). The daily descaling exceeded 5% several times throughout the season, but overall, descaling was very low (Figure A-1).

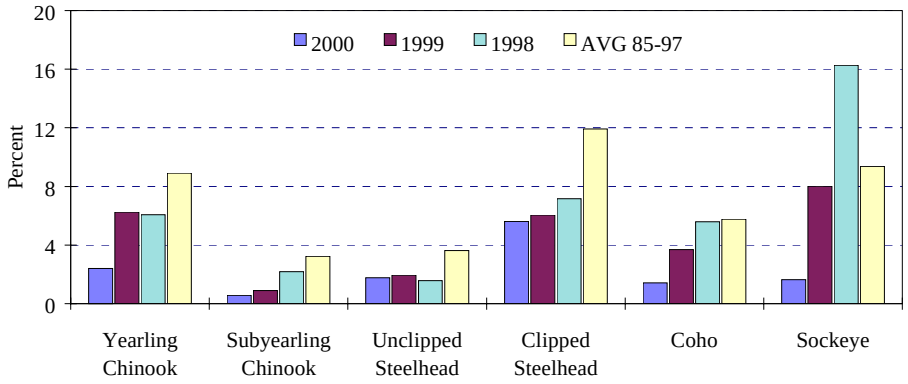

Figure 4. Total descaling for 2000, compared to 1999, 1998 and to the 85-97 average (gatewell sampling) at John Day Dam.

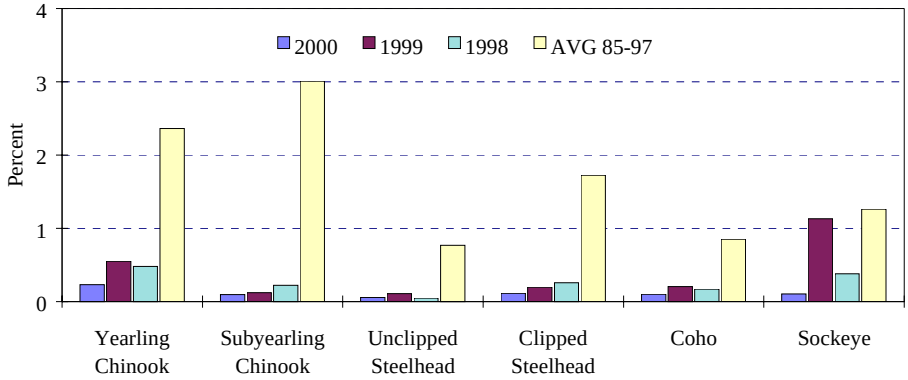

Figure 5. Total mortality for 2000, compared to 1999, 1998 and to the 85-97 average (gatewell sampling) at John Day Dam.

Mortality for yearling chinook experienced an even greater decline when the last 3 years of sampling in the new monitoring facility are compared to the airlift sampling years, 1985-1997 (Figure 5, Figure C-6, Table C-4). The difference is 6 fold, with a 0.4% rate since 1998 and a 2.4% rate prior to 1998.

Subyearling Chinook descaling has declined steadily since 1998 (Figure 6) setting a new low in 2000, with just 1,102 of 197,340, or 0.6% of the fish descaled (Table C-4). The highest daily descaling rate (N>30) was about 3% on 9 August. The rest of the season, descaling fluctuated but stayed under 2% (Figure A-1). Mortality for

subyearlings has dropped to 0.1% since sampling relocated to the new facility, down from an average of 3.0% for the years prior to 1998 (Figure C-6, Table C-4).

Unclipped steelhead descaling was about the same as the last two years at 1.8%, which is half of the 3.6% rate for the years prior to 1998 (Figure 4). Daily descaling was higher at the beginning and end of the migration than the middle, exceeding 2% on 5 days between 20 April and 20 May, but rarely going below 2% before or after those dates (Figure A-1). Mortality rates for unclipped steelhead have always been low, but since 1997, the overall mortality rate has been 0.1%, again, considerably lower than the 0.8% established in the airlift sampling years, 1985-1997 (Figure C-6, Table C-4).

Clipped steelhead descaling was the highest of all species again this year at 5.6%. This is more than twice the second highest rate of 2.4% for yearling chinook (Figure 4 and Table C-4). Again, as with the other species, descaling has declined since abandoning the airlift system, going from an average of 11.9% prior to 1998, to 5.9% since 1998 (Figure C-6, Table C-4). Mortality rates exhibited a similar pattern, averaging 1.7% prior to 1998 and just 0.2% since (Figure 7).

Coho descaling averaged 1.4% for the season, another record low (Table C-4). The average since 1998 is 2.5%, which is less than half the 1985 to 1997 average of 5.8% (Figure C-5 and Table C-4). Daily rates bounced around all season with the highest rates occurring at the end of the coho run in the third week of June (Figure A-1). Mortality was also quite low for coho, averaging just 0.1% for the season and the last three years compared to 0.9% for the years prior to 1998 (Figure C-6, Table C-4).

Sockeye descaling has been the most variable of all the species, ranging from 1.6% this year, a new low, to 21% in 1997 (Table C-4). Although sockeye descaling was relatively high in 1998, the first year of sampling in the new facility, it has come down dramatically since. However, the 16.3% rate in 1998 raised the average for the 1998 - 2000 period to 7.1%, similar to the 1985-1997 average of 9.4% (Figure C-6 and Table C-4).

Subsampled Fish Condition

In 2000, 20,520 smolts were examined for detailed condition information. Partial descaling (3-19% on one side) was lower for all species except unclipped steelhead, which went from 9.3% to 10.11%. The amount of decrease for the other species ranged from about 1 to 12 percentage points. Sockeye set a new low for partial descaling at 6.9%, about a third of last years high of 19.1%. Clipped steelhead had the highest incidence of operculum damage at 0.7%, which is 1.7% lower than last year. Again, as in past years, the incidence of attempted bird predation was much higher on hatchery steelhead (6.9%) than any other species (0.1% - 2.7%). All species, except yearling chinook, exhibited a slight decrease (1.6% to 1.8%) in the frequency of body injuries in 2000. Clipped steelhead had the highest incidence at 3.1%, down from 4.3% observed in 1999. The number of parasites on unclipped steelhead decreased from 5% in 1999 to 2.5% in 2000. Columnaris infection in subyearling chinook was down slightly from 0.1% last year to just 0.04% this year. See Methods section for a complete list of possible conditions and techniques. For a historical summary of condition subsampling results, see Table C-5.

Length Averages

Since high percentages of out migrating smolts are of hatchery origin, length data are primarily a function of smolt size at the time of release. However, graphing the data does show relative size differences and trends throughout the season. Clipped steelhead were consistently the largest fish sampled until late June. Subyearling chinook and unclipped steelhead increased in size as the season progressed and all other species varied (Figure 6).

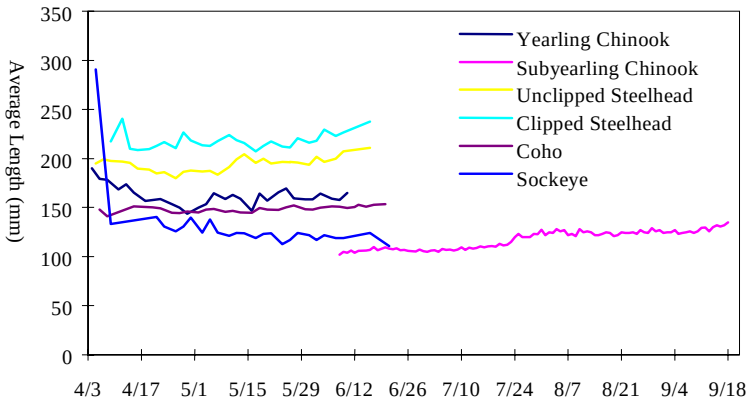

Figure 6. Average length of juvenile salmonids at John Day in 2000.

Gas Bubble Trauma Monitoring

Sampling of juvenile salmonids for Gas Bubble Trauma was discontinued at John Day in 1999. For results in 1998 and previous years, see the reports for those years or the Fish Passage Center Website.

PIT Tags and External Marks

Passive Integrated Transponder (PIT) Tags

Total PIT tag detections decreased to 30% of last season's detections, from 138,705 in 1999 to 41,848 in 2000. The decrease is not surprising considering that the 2000 collection estimate is approximately 36% of the 1999 estimate. Refer to Table C-6 for a historical comparison of PIT tag detections at John Day. Chinook (65.5%) and steelhead (32.2%) constituted 97.7% of all detections while coho and sockeye made up the remaining 2.2% of the detections. About 1% of the detections were from "holdovers", or fish that were scheduled to migrate in 1999. A summary for this year by species, run, rearing type, and scheduled migration year, can be found in Table A-1.

Elastomer Tags

One of the more popular tags replacing freeze brands is the elastomer tag. The tag is made of colored plastic that is injected into tissue posterior of the eye. A total of 7,468 elastomer tags were recorded this year, which is 1.2 times the number observed in 1999. This is a substantial increase considering the smaller total sample collected in 2000. Most of these tags (74%) were in yearling fall chinook from Lyons Ferry hatchery. Table A-2 contains more detail for these marks.

Freeze Brands

A total of 284 freeze brands were observed in 2000, up from 55 last year. All brands were on hatchery steelhead and most (98%) originated from only 4 release sites (see Table A-2). These release sites include the Touchet River (48%), Lyons Ferry hatchery (25%), Tucannon River (19%), and the Grande Rhonde River (6%). For a summary of brands per year by species see Table C-7.

Performance Monitoring

Personnel

As part of our quality control program we have developed a method of checking species identification, fin clips, descaling, and brand/tag recognition skills. In short, up to three people look at the same 10 fish and compare results. Any discrepancies are discussed while the fish is "in hand". For a full explanation of the test protocol, see the Methods section. Overall, coworkers were in agreement with each other 99.3% of the time (Table 2). No mistakes were made identifying fish to species or spotting marks (elastomer tags, freeze brands, and PIT tag scars). Clips were spotted 100% of the time and the descaled determination was made accurately 97.8% of the time.

Table 2. Results of the quality control tests.

Category	Fish ID	Clip	Descaled	Mark	Total
Errors	0	0	2	0	2
Possible	90	90	90	3	273
% Correct	100	100	97.8	100	**99.3**

Equipment

Lost or biased sample time totaled 5 hours this season, which is a 97% decrease compared to the total down time recorded during 1999. One hour of lost sample time was due to 3-way rotational gate testing, and four hours were lost when the sample rate was mistakenly set into bypass mode rather than normal sampling mode. See Table A-3 for details on biased sample days.

The screen cleaning system at the Primary Dewatering Structure (PDS) was out of service for approximately 135 days, or 80% of the sampling season in 2000. During normal operating situations, the screen cleaners are cycled every two hours. From 24 June to 15 July and 23 August to 11 September, the screens were cleaned up to several times a day using the manual mode. When the screen cleaners could not be operated in the manual mode, accessible portions of the screen were cleaned by hand with a long handled brush. Problems with the system varied but electrical, mechanical, and programming difficulties persisted throughout the season (April - September). Fortunately, the debris load in the river was light this season, which helped avoid the serious damage to equipment and salmonids that can occur when debris is allowed to accumulate.

Fry Incidence

The number of summer/fall chinook fry (≤ 60mm) collected this season was 6,555. This is approximately 94% of the 7,012 collected in 1999, 1.5 times the 4,229 collected in 1998, and 2.8 times the 2,342 collected in 1997. In 2000, 32% of the fry were collected in April, 55% were collected in May, and 13% in June (Figure 3). See Table C-8 for a summary of chinook fry collection estimates since 1987.

Adult Catch

Although the facility is equipped with an adult sampling system, it was not used in 2000 and all fallbacks were returned directly to the river. However, to gauge the quantity of fish exiting the primary dewatering structure (PDS) a hinged gate, installed in 1999 just downstream of the large fish and debris separator bars, tallied adults as they passed the gate. A total of 5,105 adult fish were tallied between 4 April and 18 September (43 days less than in 1999). It wasn't possible to collect species detail so non-salmonid incidental fallbacks are included in the count. Approximate passage times were recorded to document any obvious passage timing trend. Passage increased during the day (54%) and decreased during the night (46%) when compared to observations in 1999, when 41% passed during the day and 59% at night. See Table C-9 for a summary of fallbacks for all years of sampling.

Initially, the concern over adults holding in the PDS came from the number of adult fish found in the PDS at midseason dewaterings Table C-10. Eventually, this concern, and the fact that such a small portion of the juvenile out migration passes the project from mid September through October, (2-3%) led to the decision to shut down sampling in mid September, which we did this year.

Incidental Catch

American shad (*Alosa sapidissima*) were by far the most common incidental species captured at John Day in 2000. Juvenile shad passage started in the last week of July and peaked with an estimated 448,190 fish passing into the bypass system on 14 August. Collection estimates declined through the end of August until two smaller peaks of passage were observed on 2 September (322,788) and 15 September (335,417). From 13 July to 18 September, shad passage averaged 121,677 per day (Figure A-2). The total estimated collection number for 2000 is 8,274,057, about 1.6 times the 1999 total of 5,235,479 (Table C-11, Figure C-7)

The other incidental species present in our samples in large numbers is the juvenile (or outmigrating) Pacific Lamprey (*Lampetra tridentata).* Although outmigrating lamprey were found in our samples throughout the season, they do appear to have several distinct passage peaks. The first and highest passage peak was 18,621 on 9 April, while two smaller peaks of 6,779 on 9 June and 8,212 on 17 June were also observed (Figure A-2).
The total estimated lamprey collection for 2000 is 141,661. Approximately 98% of the outmigrating lamprey were smolted (macropthalmia), while the remaining 2% were ammocetes in various stages of metamorphosis. This years collection estimate is only 84% of last years estimate of 167,856, yet is still dramatically higher than all years prior to 1998 due to the switch from "single gatewell" to "full bypass" sampling (Table C-11 and Figure C-7).

Research

During the season, smolt-monitoring personnel provided support to nine research projects, listed below by agency. Support included activities such as: fish collection and enumeration, equipment set up/modification, and handling. Fish were collected from the general sample or with the Separation by Code (SBC) system.

U.S. Geological Survey-Western Fisheries Research Center-CRRL

1. *Monitoring of Tailrace Egress in the Stilling Basin, the Ice-Trash Sluiceway, and the Powerhouse of The Dalles Dam, 2000.* Principal Investigators: M. Brady Allen, Mandy and Theresa Liedtke. Radio telemetry was used to examine the movements and behavior of yearling and subyearling chinook salmon in the tailrace of The Dalles Dam to evaluate the spillway, sluiceway, and turbines as juvenile salmonid passage routes during a 40% juvenile spill pattern. A total of 779 yearling chinook and 1,087 subyearling chinook were collected for radio tagging at the Smolt Monitoring Facility (SMF) for this research in 2000.

2. *Monitoring Tailrace Egress in the Stilling Basin and at the Bypass System Outfall to Determine Differences That May Lead to Increases in Predation or Causal Mechanisms of Mortality at John Day Dam, 2000.* Principal Investigator: Israel Duran and Theresa Liedtke. Radio telemetry was used to describe the movements and behavior of yearling and subyearling chinook salmon and yearling steelhead to evaluate the spillway and juvenile bypass system as juvenile salmon passage routes. A total of 205 yearling chinook, 185 steelhead, and 184 subyearling chinook were collected for radio tagging at the John Day SMF for this research.

3. *Estimates of Fish and Spill Passage Efficiency of Radio-Tagged Juvenile Steelhead and Chinook Salmon at John Day Dam, 2000.* Principal Investigators: John Beeman, Philip Haner, Hal Hansel, and Jill Hardiman. Utilizing radio telemetry, fish passage efficiency (FPE), spill passage efficiency (SPE) and sluiceway passage efficiency (SLPE) of yearling chinook and steelhead smolts at The Dalles Dam were estimated using a 40% juvenile spill pattern. A total of 987 yearling chinook smolt, 963 steelhead smolt, and 482 subyearling chinook were collected for radio tagging at the John Day SMF for this research.

National Marine Fisheries Service, Fish Ecology Division.

4. *Relative Survival of Juvenile Salmon Passing Through the Spillway at The Dalles Dam, 2000.* Principal Investigators: Earl Dawley and Randy Absolon. Approximately 297,337 smolt (45,555 coho, 89,920 yearling chinook, and 161,862 subyearling chinook) were PIT tagged for use in evaluating the relative survival through the spillway at The Dalles Dam during a 40% spill rate. For the duration of the 12-week tagging period, the SMP sample rate was increased from 2000-0300 to get enough fish for tagging. Three PIT tagging stations were plumbed and installed inside the Smolt Monitoring Facility (SMF) laboratory. Approximately 5,000 - 6,000 smolts were needed for each night of tagging (six days a week). All PIT tagged fish were routed to transport tanks and held for about one day before release into The Dalles Dam forebay.

5. *Post Construction Evaluation of the Juvenile Fish Monitoring Facilities and Conveyance Pipe at Bonneville Dam Second Powerhouse*. Principal Investigators: Lyle Gilbreath and Sandra Downing. In its second year, this evaluation determined detection and separation efficiencies of the new PIT-tag system, retention and physical condition of chinook salmon fry passing through the bypass system, and effects of system passage on physical condition of run-of-the-river yearling chinook salmon, sockeye salmon, and subyearling chinook salmon. Due to lower sample numbers at the Bonneville SMF, approximately 1,132 sockeye smolts were collected for their use at the John Day SMF during May.

A cooperative effort between the NMFS-Northwest Fisheries Science Center and the Yakima Indian Nation:

6. *Physiological Assessments of Wild and Hatchery Juvenile Salmonids.* Principal Investigators: NMFS: Donald Larson, Yakima Nation: Bruce Watson. This study collected fish using the Separation by Code (SBC) capabilities at John Day SMF. The objective of their research was to make physiological assessments of wild and hatchery juvenile salmon during the 2000 out-migration. The SBC system diverted a total of 95 target chinook and 291 non-target salmon smolts.

Oregon Cooperative Fish and Wildlife Research Unit, Oregon State University

7. *Determination of Passage of Juvenile Lamprey: Development of a Tagging Protocol.* Principal Investigators: Scott Heppell, Carl Schreck and Darren Lerner. This is a continuation of a study designed to evaluate telemetry options to study juvenile lamprey passage around U.S.A.C.E. projects. A component focusing on fungus control of captive lamprey was added in 2000 to resolve problems associated with the long-term holding of juvenile lamprey in the laboratory. A total of four adult and 513 juvenile Pacific lamprey were collected for use in this research during the 2000 out-migration, primarily in April and May.

Pacific Northwest National Laboratory-Battelle

8. *Effects of Dam Passage on Juvenile Pacific Lamprey.* Principal Investigator: Russel Moursund, Robert Mueller, Traci Degerman, and Dennis Dauble. In 2000, PNNL continued a study to evaluate the effects of juvenile bypass screens and other project operations on juvenile Pacific lamprey survival. This seasons evaluation included impingement rates using various screening material, effect of angled screens, effect of light and pressure on migrating lamprey, and a field study to determine lamprey/screen interactions. Approximately 540 outmigrating Pacific lamprey were collected in April and 200 were collected in June for this research.

Idaho Cooperative Fishery Research Unit, University of Idaho

9. *Effects of Multiple Dam Passage on the Physiological Condition of Juvenile Salmonids.* Principal Investigators: James Congleton and Bill LaVoie. Fish were collected using the Separation by Code (SBC) capabilities of the system. The objective of this research was to evaluate the effects of multiple dam passage on the physiological condition of salmon smolts. The SBC system diverted a total of 256 target hatchery spring chinook and 235 non-target salmon smolts.

BONNEVILLE DAM

Included in this year's report are program summary tables. See Table D-16 (PH1) and Table D-17 (PH2) for a summary of all years of sampling, including sample dates, sampling effort, sample, collection, and index numbers. Also, this was the first year of sampling in the Hamilton Island Juvenile Monitoring Facility. Consequently, Index level sampling was transferred from the first powerhouse to the second powerhouse. This change resulted in sample numbers for both locations being quite different from previous years.

The Numbers

Sample Numbers – First Powerhouse

The total number of fish sampled in the first powerhouse at Bonneville Dam in 2000 was 17,948. Since the level of sampling effort was greatly reduced (see Methods section), comparison to last year will be minimal. Species specific sample numbers can be found in Table 1; comparisons to previous years can be found in Table D-16. Subyearling chinook constituted 41.7% of the sample numbers, followed by yearling chinook (28.4%), coho (13.7%), clipped steelhead (7.7%), unclipped steelhead (7.3%), and sockeye (1.2%)(Table 1).

Calculation of Collection and Index estimates for the first powerhouse was discontinued this year. See the discussion below for those estimates from the second powerhouse. For a complete listing of sample, collection, and index numbers by species for all years of sampling, including season dates and sampling effort, see Table D-16.

Sample Numbers – Second Powerhouse

The total number of fish guided by the second powerhouse bypass system and sampled at the Hamilton Island Juvenile Monitoring Facility (JMF) was 54,070. The species composition was as follows: subyearling chinook, 36.4%; yearling chinook, 32.1%; coho 21.5%; clipped steelhead, 5.3%; unclipped steelhead, 4.1%; and sockeye, 8%. For a listing of the numbers please refer to Table 1.

Collection Estimates

Collection estimates represent the number of fish passing through the bypass system at the second powerhouse and are calculated by dividing the sample number by the sample rate. This is the first year we have a collection estimate for the second powerhouse and it is 2,790,908. There are numerous components that affect collection estimates, but the primary factor is flow distribution. If more water is spilled, or run through the first powerhouse, fewer fish go through the second powerhouse. Other factors include Fish Guidance Efficiency (FGE), natural and hatchery production, transportation, research activities, and others.

Fish Passage Indices

Collection numbers are divided by the proportion of river flow through PH2 to get a Fish Passage Index (FPI) for the entire project. The Index represents the total number of fish passing the project. It is affected by the same factors as the collection estimates, discussed above, and others. It is most useful for in-season monitoring of run timing and size. The 2000 index total for all species combined was 9,054,957. Sample, collection, and index numbers by species can be found in Table 1. See the Fish Passage Center Annual Report for more information.

River Conditions

River Flow

Spring river flow, through May, averaged 251.7 kcfs, compared to 280.5 kcfs in 1999. The peak flow for this period, and the season, was 384.4 kcfs on 24 April, during special flow operations for a Spring Creek Hatchery release. Last year, the high flow for this same period was 384.3 kcfs on 28 May. For June and July, river flow averaged 251.7 kcfs, about 45 kcfs lower than the 299.7 kcfs for the same period last year. Flows for the late summer/fall period, August through October, were lower than for the same period in 1999, averaging 127.8 versus 161.1 kcfs last year.

Due to operational priority for Surface Collection studies and extended length bar screen testing at PH1, discharge from PH2 was minimal throughout the summer. For much of the time from 18 June through 1 September, only fish units were operated in PH2. The discharge for the period was frequently 5 to 6 kcfs and averaged just 10 kcfs overall. This greatly reduced the number of fish guided into the PH2 JBS and resulted in very small samples at the JMF. It was not uncommon to sample only 1 or 2 fish for a 24 hour period at the maximum sample rate (25%). The overall average for the period was just 44 fish per day.

Spill during the 8 day period following the 9 March release of 8.2 million tule fall chinook from Spring Creek National Fish Hatchery (SCNFH) averaged about 97.2 kcfs or 47% of river flow (Table 3). Spill averaged 114.6 kcfs (35% of river flow) between 21 April and 30 April to facilitate passage of the 4.3 million tule fall chinook released from SCNFH on 20 April. For the third SCNFH release of 3.7 million fish on 18 May, spill averaged 85.4 kcfs or 33% of river flow for the 10 days following the release (Table 3).

Table 3. 2000 Spring Creek National Fish Hatchery releases.

Release Date	Number (millions)	Peak PH2 Passage	Average Spill	Spill as % of River
March 9	8.2	9 March	77.7	47
April 20	4.3	20 April	114.6	35
May 18	3.7	18 May	85.4	33

Shifting of flow from PH2 to spill following a Spring Creek release is thought to increase the number of those fish passing the project via the spillway and improve survival.

Passage Patterns- Seasonal passage

Yearling Chinook run timing and duration were very similar to last year and all previous years. The duration of the middle 80% was the same as last year at 40 days (Figure 7). Over the history of the monitoring program, this duration has been quite consistent, ranging from 31 to 41 days (Figure D-2, Table D-2). Also, as in the past, most passage occurred during the last two weeks of April and throughout May, coinciding with the seasonal high flows (Figure 8). There was one uncharacteristically late passage peak this year on 26 May when almost 7% of the season total passed Bonneville (Figure D-1).

Subyearling Chinook passage is a combination of Spring Creek Hatchery releases of Tule stock, all occurring prior to June, and upriver Bright stock, passing the project after 1 June, and fry (Figure 8). The Tule hatchery releases are obvious passage peaks occurring a day or two after the release dates listed in Table 3 above. Since this hatchery is only 21 miles upstream from Bonneville, and the releases are large (see Table 3) they pass in large groups (Figure 8) often requiring that we minimize the sample rate or sometimes stop sampling altogether.
The passage timing and duration of the middle 80% listed in tables and shown in figures is for the upriver Bright stock, moving past Bonneville after 1 June. The duration for these migrants was about the same as last year but shifted forward by a few days (Figure 7). The duration of the middle 80% (45 days) is in the middle of the range (35 – 55 days) observed over the history of the monitoring program. The magnitude of the upriver Bright migration is below the average throughout the summer (Figure D-1). The fry mostly pass Bonneville prior to June and generally passage is decided by flow volume (Figure 8).

Unclipped Steelhead passage was nearly identical to last year, reaching the 10% passage point just one day earlier, and taking a total of 40 days to reach the 90% mark (Figure 7), a new record for the duration of the middle 80% to pass Bonneville for this species (Figure D-2). Unclipped steelhead were present in our samples from 19 April through 14 June with the largest passage peak occurring on 26 May (Figure 8). This year's timing and magnitude are quite similar to the historical average for this species (Figure D-1).

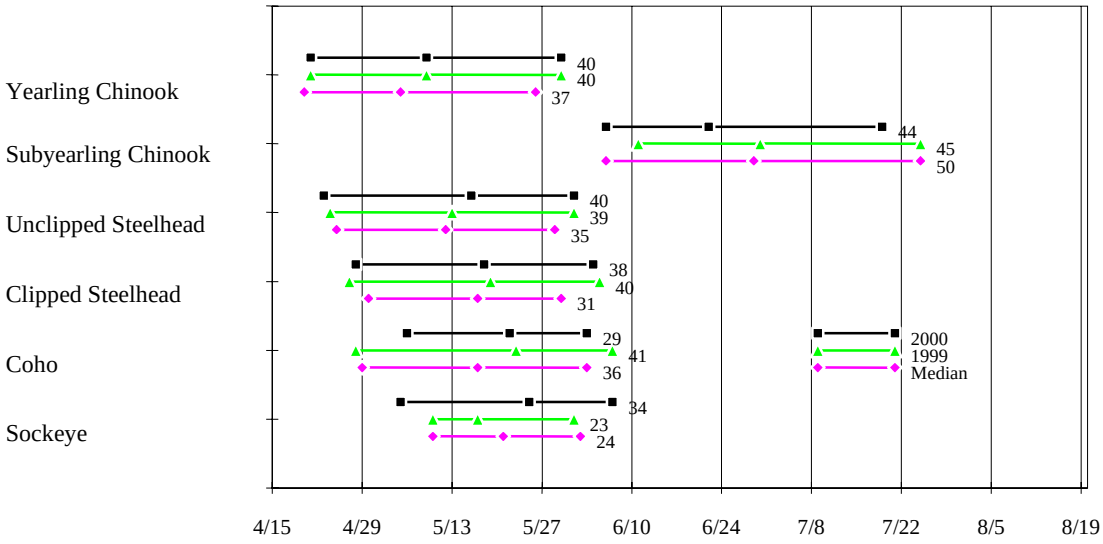

Figure 7. 10%, 50%, and 90% passage dates from PH2 for 2000, PH1 for 1999, and the historical median at PH1, 1988-1999. The duration in days between the 10% and 90% passage dates is indicated for each line.

Clipped Steelhead passage reached the 10% passage point one day later and the 90% mark one day earlier than last year, resulting in a middle 80% duration just 2 days shorter than in 1999. At 38 days, it is the second longest middle 80% migration duration for this species (Figure D-2). The passage peak occurred on the same day as the unclipped steelhead passage peak and was of similar magnitude, about 7% of the total index for this species (Figure 8). The daily variation was similar to the historical average (Figure D-1) and the clipped steelhead were present from mid April to mid May (Figure 8).

Coho passage started later and ended earlier this year, resulting in a middle 80% duration of 29 days, compared to 41 days for last year (Figure 7). There has been a lot of variation in the coho migration over the years, ranging from 22 to 48 days (Figure D-2). The earlier 90% date is the result of a large passage spike on 24 May that was about 9% of the total index (Figure 8). This was an unusual spike when compared to the historical average pattern and most likely the result of a hatchery release (Figure D-1).

Sockeye passage has also been highly variable throughout the years, with the middle 80% duration ranging from 11 to 48 days (Figure D-2). The duration this year is the second longest ever recorded at 34 days and is considerably longer than last year or the historical median (Figure 7). Sockeye passage is split up by clipped and unclipped in Figure 8, which shows two distinct passage peaks in late May and early June for unclipped sockeye and several later peaks, around the end of June, for clipped sockeye.

Diel

In 2000, sampling in the first powerhouse was reduced to condition monitoring and GBT exams. Sampling was conducted from 1600 to 2400 hours, but sample rates and hourly detail were not recorded. However, crew reports of diel passage patterns were consistent with previous years data. Passage for all species increased at dusk and peaked between 2100 and 2200 hours. This is consistent with the passage pattern established during the 4 years of 24 hour monitoring (92-95) (Figure D-3 and Figure D-4). For a total percent night passage by species for each year of 24 hour monitoring, see Table D-1, and for percent of total passage per hour by species for the four years of diel monitoring, see Table D-3.

Samples from the second powerhouse were collected over 24 hour periods through the use of a timed subsample gate at the JMF. Consequently, no diel information is generated at this facility.

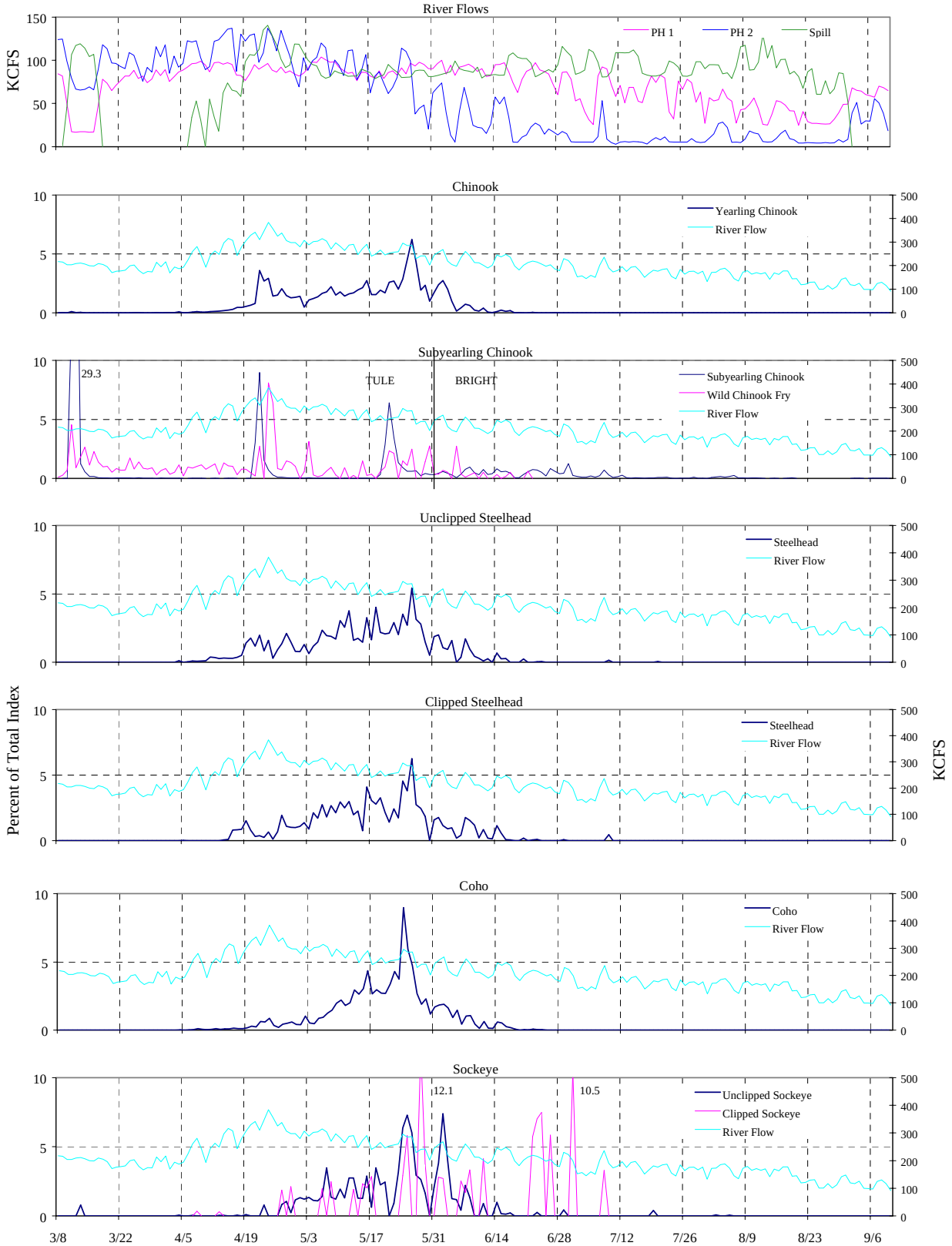

Figure 8. Seasonal passage patterns and daily average river flows at Bonneville Dam, PH2, 2000.

Fish Condition
Powerhouse 1 - Descaling

Descaling in 2000 was higher than last year and the historical average for all species (Figure 9, Table D-4, and Figure D-5). The largest increase was for sockeye, going from 7.4% last year to 23.0% this year, more than triple the rate last year (Table D-4). Similar increases were observed for the other species. While descaling routinely fluctuates, it is difficult to explain the large increases seen this year. The record low levels of descaling recorded last year make the increases even more dramatic. There were a couple of nights this year when descaling was especially high and those nights no doubt contributed to the overall high rate of descaling (see the Mortality section below for a description of the worst night). Another possible influence is the subjectivity of deciding if a descaled area is equal to 20% of one side of the fish. We do extensive training is this area but in the end, the decision is subject to the perception of the handler.

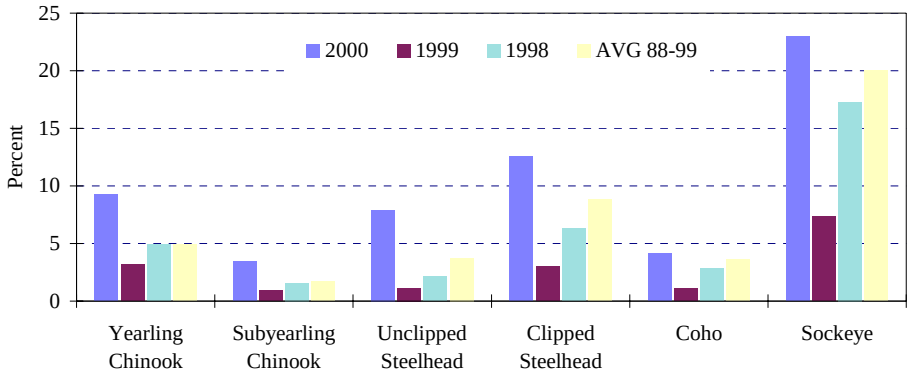

Figure 9. Total descaling for 2000 at PH1, compared to 1999, 1998 and the 88-99 average at Bonneville Dam, PH1.

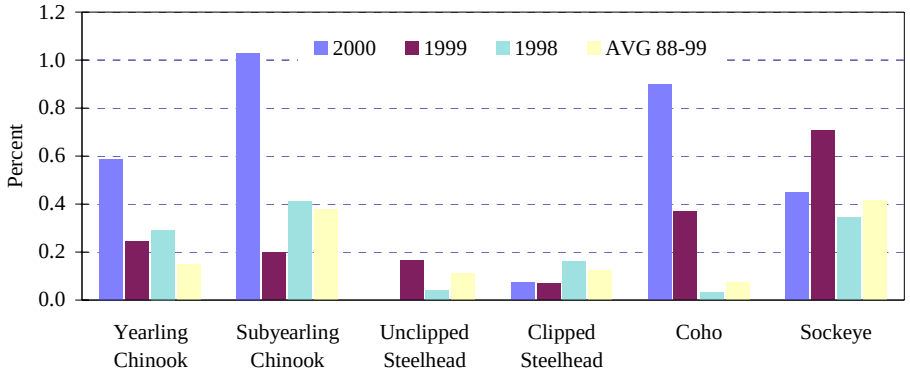

Figure 10. Total mortality for 2000 at PH1, compared to 1999, 1998 and the 88-99 average at Bonneville Dam, PH1.

Mortality
Mortality in PH1 samples varied by species but overall was low, as usual for this location. Increases were observed for yearling chinook, subyearling chinook, and coho (Figure 10). Most of the increase in mortality, and much of the increase in descaling, can be explained by a single night. On 5 June, 45 of the 132 mortalities for the season were recorded. On this night, a problem in the bypass system, most likely a plugged orifice, killed fish that showed up in our samples. The nature of the problem was never verified but a plugged orifice, cleared by the routine flushing cycle, is our best guess. See Figure D-6 for a graphic comparison of the mortality from first powerhouse samples and Table D-4 for a listing of the actual numbers and percentages for each species.

Powerhouse 2 - Descaling

This is the first year of sampling in the new Juvenile Monitoring Facility. One should bear in mind the many differences between the two systems when reviewing these results. See Martinson, et al., 1997, 1998 for details on

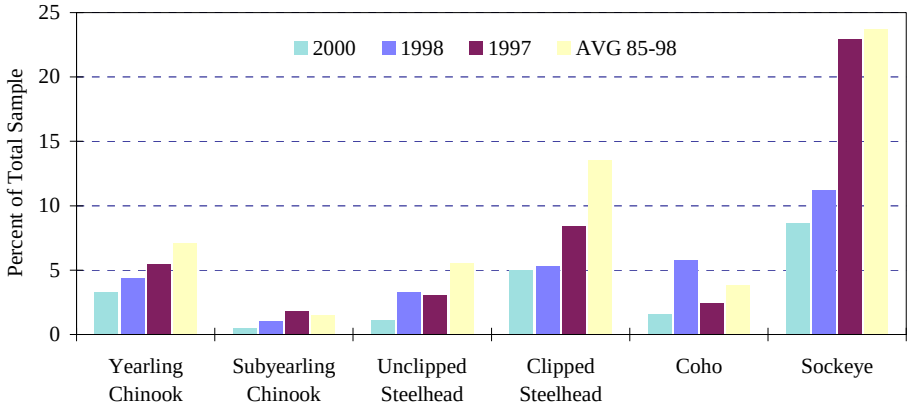

Figure 11. Total descaling for 2000 at PH2, compared to 1998, 1997 and the 88-98 average at Bonneville Dam, PH2.

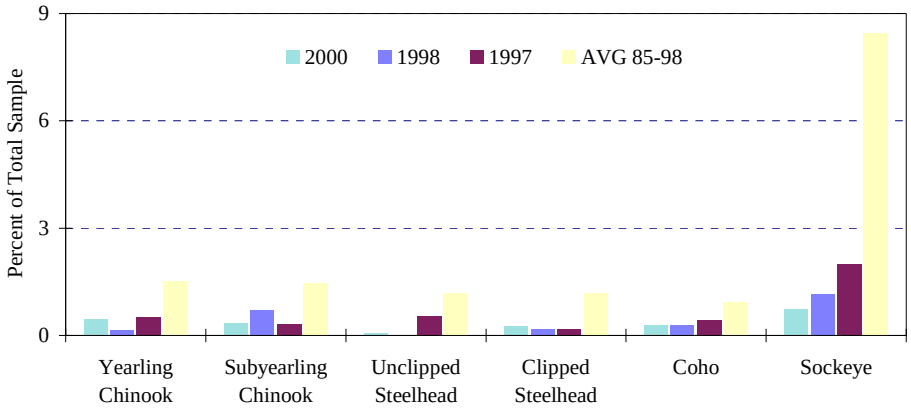

Figure 12. Total mortality for 2000 at PH2, compared to 1998, 1997 and the 88-98 average at Bonneville Dam, PH2.

the old system. See Table D-17 for a summary of sampling effort at PH2 in the past. However, the condition results from the first year of sampling in the new facility, a decline in the descaling rate for all species, would suggest that the new system works quite well (Figure 11, Figure B-1). Of course, there are many variables that can affect fish condition, but the reduction in descaling rate across the board is a strong indication that the new system passes fish safely (Figure D-7, Table D-5).

Mortality

Increases in mortality rates were observed for yearling chinook, and clipped steelhead, but the levels are quite low so the increase is likely normal variability and not attributable to the new facility (Figure 12, Figure D-8, and Table D-4).

Subsampled Fish Condition

Powerhouse 1

From powerhouse 1, a total of 8,430 smolts were examined for detailed condition subsampling in 2000. Partial descaling (3-19%) was the most prevalent condition in the PH1 samples. Partial descaling rates ranged from 27.8% for sockeye to 5.1% for coho. The incidence of attempted bird predation was highest for clipped steelhead at 11.5%, similar to the 10.9% rate in PH2. However, the unclipped steelhead rate of 6.4% was more than double the rate for PH2 (2.88%). The incidence of external parasites on unclipped steelhead was 8.7% compared to 5.9% in powerhouse 2. Incidence of fungus was highest in coho (2.8%) and yearling chinook (2.0%) while other species were less than 1%. For more details on this data and a historical summary of condition subsampling, see Table D-6.

Powerhouse 2

A total of 11,685 smolts were examined for detailed condition subsampling in 2000 at PH2. Previous years sampling in PH2 did not gather detailed condition data so this years results from PH2 are compared to 1999 results from PH1. We felt this was justified since most of the categories represent the condition of the "run at large" and are not specific to a powerhouse bypass system, except for descaling. The incidence of attempted bird predation increased for clipped steelhead to 10.9% from 5.7% in 1999. Unclipped steelhead showed a slight increase in incidence of attempted bird predation to 2.9% from 2.0% in 1999. Incidence of external parasites on unclipped steelhead decreased to 5.9% from 9.7% last year. Incidence of fungus was uniformly low; the highest percentage was in clipped steelhead at 1.1% while other species were less than 1%. Partial descaling (3-19%) was the most prevalent condition ranging from 34.4% for sockeye to 10.8% for subyearling chinook Additional condition subsampling percentages are presented in Table D-7.

Gas Bubble Trauma Examinations

Gas bubbles were found in 12 of 5,561 fish examined in 2000 for an overall incidence of 0.20%. Almost 92% of the bubbles were in the lateral line, 8% were found in the unpaired fins, while no bubbles were observed in or around the eyes. All symptoms were of rank 1 or 2, no severe Gas Bubble Trauma (ranks 3 or 4) was observed this year. Clipped steelhead had the highest incidence of bubbles at 0.34% (3 of 883) followed by unclipped steelhead at 0.32% (3 of 932). Fall chinook were observed with 0.18% (4 of 2,183) while 1 of 1,563 (0.06%) spring chinook had bubbles. The symptoms were evenly distributed in May, June, and July at 27.3% each month. About 9% of the bubbles were observed in April and August, respectively (Table B-5). For more details on the gas bubble monitoring results, see the Fish Passage Center annual report.

Length Averages

Individual fish lengths were obtained in conjunction with the fish condition subsampling. Since so many of the fish are of hatchery origin, this data is largely a function of size at time of release. The results are intended to show relative length trends throughout the season and are presented in Figures 13 And 14. Clipped steelhead, as in past years, remained the largest juvenile salmonid sampled throughout the season. Similar length trends were exhibited in 1998 and 1999. Clipped steelhead, unclipped steelhead, and subyearling chinook showed increasing size trends as the season progressed, while yearling chinook and coho varied over the course of the migration. Conversely, a decreasing size trend was noted for sockeye over the course of the season in both powerhouses.

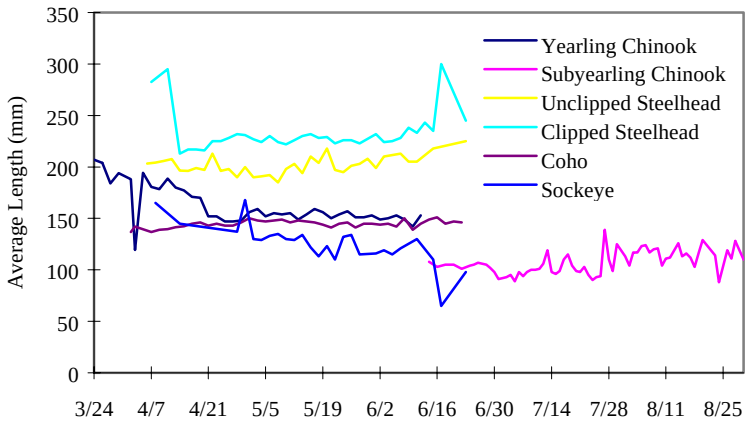

Figure 13. PH1 average length of juvenile salmonids at Bonneville Dam, 2000.

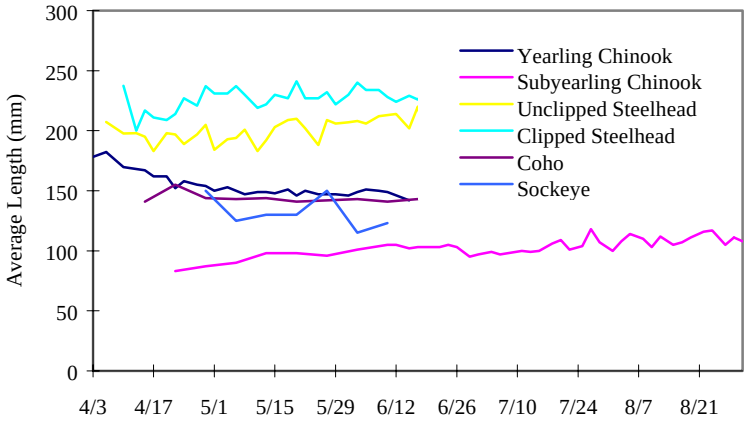

Figure 14. PH2 average length of juvenile salmonids at Bonneville Dam, 2000.

PIT tags and External Marks

PIT Tags

A total of 86,842 PIT tags were detected at Bonneville this year, a 34% decrease from 1999 (130,998). A summary (by species, run, and rearing type) of PIT tags detected at Bonneville Dam for 2000 can be found in Table B-1. Table D-8 summarizes PIT tag records by year for all years of interrogation at Bonneville Dam. The marked decrease in PIT tag detections may be partially due to unpredictable flows through PH2 due to operational priority for Surface Collection System studies and extended length bar screen testing at PH1.

Elastomer Tags

At PH1, 85 elastomer tags were recorded this year, down from 185 in 1999. All 68 of the tagged yearling fall chinook were released into the Snake River from the Lyons Ferry Hatchery. The three tagged yearling summer chinook were from the McCall Hatchery's and released into the South Fork of the Salmon River. All of the tagged summer steelhead (14) originated from the Chiwawa Hatchery on the Wenatchee River (Table B-2).

At PH2, 307 elastomer tags were recorded in 2000. Almost 90% (275) of those were observed on yearling fall chinook from Lyons Ferry Hatchery, while 1% (3) were recorded on yearling summer chinook from McCall Hatchery. The remaining 9% (29) were summer steelhead originating from Chiwawa Hatchery on the Wenatchee River (Table B-3).

Freeze Brands

At PH1, no freeze brands were recorded this year, down from one last year (Table D-9).

At PH2, 11 freeze brands were recorded this year. All originated at Lyons Ferry Hatchery with almost half (5) from the Touchet river release site. The rest came from the Tucannon , Grande Rhonde, or Snake Rivers (Table B-3).

Fry Incidence

In PH1, 18 chinook and 5 coho fry were sampled (Table D-14). This is much reduced from previous years but was expected due to the reduction in sampling effort. There was no expansion for collection.

At PH 2 the number of chinook fry (< 60mm) sampled this season was 1,118, while coho fry totaled 6. When expanded by sample rate, these numbers generated a collection estimate of 18,790 chinook fry and 40 coho fry. In prior years there were no collection estimates so comparisons are difficult. In 2000, 34% of the chinook fry were collected in March, 43% in April, 20% in May, and 3% in June (Figure 8). See Table D-15 for a summary of sample and collection numbers for fry by year.

Adult Catch

At PH1 the sample collection equipment is designed to pass adult fish. As a result, very few, if any, adults are collected in our samples. No adults have been captured during the last three years (Table D-10).

At the JMF for PH2, the separator bars on the PDS juvenile hopper are designed to exclude adult fish from the general sample. However, small adult salmonids may occasionally pass through the separator bars and divert to the sample collection tank. In 2000, 11 chinook jacks, one chinook minijack, and one adult steelhead (kelt) were caught in our samples (Table D-11).

Incidental Catch

Powerhouse 1

In PH1, American Shad *(Alosa sapidissima)* juveniles were the most prevalent incidental species sampled. Juvenile shad were present in the samples from 8 August through the end of sampling on 2 September. Passage peaked on 2 September with a sample count of 1000 (Figure B-2). The overall sample number in 2000 was 1,493.

Only seven Pacific Lamprey *(Lampetra tridentata)* juveniles were found in the condition and GBT samples from 6 April through 3 August. Of the 7 lamprey sampled three were smolted. A historical summary of incidental catch is presented in Table D-12. A graphical summary of juvenile shad and lamprey collection estimates by year is presented in Figure D-9.

Powerhouse 2

In PH2, American Shad *(Alosa sapidissima)* juveniles were the most prevalent incidental species sampled. Juvenile shad were present in the samples from mid July through the end of October and passage peaked on 5 October with a collection estimate of 778,879 through the Juvenile Monitoring Facility (Figure B-2). The total collection estimate for 2000 was 4,359,372 (Table D-13).

Pacific Lamprey *(Lampetra tridentata)* juveniles were found sporadically in samples from 9 March through 15 June and a few individuals in September and October. Two distinct passage peaks occurred on 9 March and 23 April representing collection estimates of 864 and 750, respectively. Sample numbers expanded by the sample rate generated a total collection estimate for the season of 7,500 (Table D-13), of which, over 98% were smolted.

Performance Monitoring

Personnel

As part of our quality control program, we developed a method of checking species identification, fin clips, descaling, and brand/tag recognition skills. Two people examined the same 10 fish and compared results. Any discrepancies were discussed while the fish was "in hand". For a full explanation of the test protocol, see the Methods section. The "Descaled" category generated the lowest efficiency rating at 97.0%. Overall, coworkers were in agreement 99.0% of the time (Table 4).

Table 4. Results of quality control tests.

Category	**ID**	**Clip**	**Descaled**	**Mark**	**Total**
Errors	0	0	42	0	42
Possible	1380	1380	1380	18	4158
% Correct	100	100	97.0	100	**99.0**

Equipment

At PH1, no hours of sampling were missed this season.
At the PH2 JMF, 58 hours of sampling was missed, about 1.0% of the season. See Table B-4 for more details on lost sample time.

Research

During the season, smolt-monitoring personnel provided support to five research projects listed below. Support included activities such as: fish collection and enumeration, equipment set up/modification, and handling. Fish were collected from the general sample or by the Separation by Code (SBC) system.

U.S. Geological Survey-Biological Resources Division, (USGS-BRD) .

1) Evaluation of the New Bonneville Dam Second Powerhouse Juvenile Bypass System. Principal Investigator: Glen Holmberg. This study was designed to determine: 1) The physiological effects on smolts traveling through the conveyance pipe. This objective was accomplished by measuring plasma cortisol and lactate levels in fish recovered from the JBS. 2) The effects of passage through the conveyance pipe on tailrace egress behavior, and 3) How water velocities in the tailrace influence fish movements. Radio telemetry was used to examine passage and tailrace behavior. Approximately 1,800 fish were obtained for cortisol and lactate samples while 450 were held for radio-tagging purposes.

2) Movement, Distribution, and Passage Behavior of Radio-Tagged Juvenile Salmonids at Bonneville Dam Associated with the Surface Bypass Program, 2000. Principal Investigator: Noah S. Adams. Fish were radio tagged for use in evaluating passage routes in the forebay and to determine general juvenile salmonid behavior upon approach to the Primary Surface Collector (PSC) located at Bonneville Dam Powerhouse 1. A total of 1,573 yearling chinook, 1,173 steelhead, and 829 subyearling chinook were held at the JMF and at PH1 for this research in 2000.

Oregon Cooperative Fish and Wildlife Research Unit, OSU. *Evaluation of Migration and Survival of Juvenile Steelhead Following Transportation and Evaluation of Migration and Survival of Juvenile Fall Chinook Following Transportation.* Principal Investigators: Carl Schreck and Tom Stahl. The objectives of this study were aimed at understanding whether barging is affecting, through physiological condition, smolt migration behavior in relation to saltwater entry, vulnerability to avian predators, and survival of barged versus run-of-the-river fish in the Columbia River estuary. A total of 181 clipped steelhead and 105 subyearling fall chinook were collected for this research. Of those, 143 clipped steelhead and 62 subyearling fall chinook were radio-tagged with either gastric or surgical implantation tags and released into the river.

National Marine Fisheries Service, Fish Ecology Division.

Post-Construction Evaluation of the Smolt Monitoring Facility (SMF) at Bonneville Dam. Principal Investigator: Lyle Gilbreath. The study objectives were three-fold: 1) To evaluate retention and condition of chinook fry through the juvenile bypass system at Bonneville Dam Second Powerhouse. Approximately 700 fry were released into various sections of the Powerhouse 2 juvenile bypass channel and recovered from the sample holding tank at the JMF. These fish were observed for descaling and a release to recovery ratio was calculated. 2) To determine detection and separation efficiencies of the PIT-tag detection system using PIT-tagged hatchery-reared steelhead and subyearling chinook salmon. Approximately 600 fish of each species were released, one by one, into the JMF sample flume just downstream from the Secondary Dewatering Structure and recovered in the east or west separation by code tanks. 3) To determine the effects of system passage on the physical condition of run-of-the-river yearling chinook salmon, subyearling chinook salmon, and sockeye salmon. Approximately 1,200 yearling chinook and 1,100 subyearling chinook were released into various sites in the upper collection channel in PH2, while 500 sockeye were released into PH2 forebay, gatewells 11B and 18B, and the upper collection channel. Recovered fish were examined for descaling percentage.

Idaho Cooperative Fishery Research Unit, University of Idaho. *Effects of Multiple Dam Passage and Transportation on the Physiological Condition of Migrating Juvenile Salmon and Steelhead.* Principal Investigators: James Congleton and Bill LaVoie. Fish were collected using the Separation by Code (SBC) capabilities of the system. The objective of this research was to evaluate the effects of multiple dam passage on the physiological condition of salmon smolts. The SBC system diverted a total of 210 target hatchery spring chinook.

ACKNOWLEDGMENTS

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We acknowledge the very capable efforts of our Biological technicians and laborers, including at Bonneville: John Barton, Larry Dick, Cheryl Engle, Martha Jenkins, Mildred Johnson, Nickie McConnell, Robert B. Mills, William Myers, Jerry Rogers, and Thomas Ryan; and at John Day: Julie Knightlinger, Jolanta Glabek, and Phillip Smith.

LITERATURE CITED

Brege, Dean A., R.C. Johnsen, and W.E. Farr, 1990. An Airlift Pump for Sampling Juvenile Salmonids at John Day Dam. North American Journal Fisheries Management 10:481-483.

Fish Passage Manager, 1994. 1993 Fish Passage Center Annual Report. Columbia Basin Fish and Wildlife Authority, Portland, OR. 60p plus Appendices. (Annual Report to BPA for project no. 94-033, contract DE-FC79-88BP38906).

Gessel, M.H., L.G. Gilbreath, W.D. Muir, and R.F. Krcma, 1986. Evaluation of the Juvenile Collection and Bypass Systems at Bonneville Dam- 1985. U.S. Dept. Comm., NOAA, NMFS, NW&AFC, Seattle, WA. 63p plus Appendix. (Report to U.S. Army Corps of Engineers, Contract DACW57-83-H 001).

Hawkes, L.A., R.D. Martinson, R.J. Graves, D.R. Carroll and S. Killins, 1993. Monitoring of Downstream Salmon and Steelhead at Federal Hydroelectric Facilities, Annual Reports. U.S. Dept of Comm., NOAA, NMFS, ETSD, Portland, OR. (Annual Reports to BPA for project no. 84-14, contract DE-AI79-85BP20733).

Martinson, R.D. R.J. Graves, M.J. Langeslay, L.A. Wood, and S. Killins, 1994. Monitoring of Downstream Salmon and Steelhead at Federal Hydroelectric Facilities, Annual Reports. U.S. Dept of Comm., NOAA, NMFS, ETSD, Portland, OR. (Annual Reports to BPA for project no. 84-14, contract DE-AI79-85BP20733).

Krcma, R. F., M. H. Gessel, W. D. Muir, S. C. McCutcheon, L. G. Gilbreath, and B.H.Monk, 1984. Evaluation of the Juvenile Collection and Bypass System at Bonneville Dam-1983. U.S. Dept. Comm., NOAA, NMFS, NW&AFC, Seattle, WA. 56p plus Appendix. (Report to U.S. Army Corps of Engineers, Contract ACW57-83-F-0315).

Matthews, G.M., D.L. Park, T.E. Ruehle, and J.R. Harman, 1985. Evaluation of Transportation of Juvenile Salmonids and Related Research on the Columbia and Snake Rivers, 1984. U.S. Dept. of Comm., NOAA, NMFS, NW&AFC, Seattle, WA, 27p. plus Appendix. (Report to U.S. Army Corps of Engineers, March 1985, Contract DACW68-84-H-0034).

McConnell, R.J, and W.D. Muir, 1982. Preliminary Evaluation of the Bonneville Juvenile Bypass System - Second Powerhouse. U.S. Dept. of Comm., NOAA, NMFS, NW&AFC, Seattle, WA. 8p. (Report to U.S. Army Corps of Engineers, Contract DACW57-82-F-0398).

Mayden, Richard L., 1992. Systematics, Historical Ecology and North American Freshwater Fishes. Pg. 33. Stanford University Press, Stanford, California.

O'Leary, John A., Kynard, Boyd, 1986. Behavior, Length, and Sex Ratio of Seaward -Migrating Juvenile American Shad in the Connecticut River. Transactions of the American Fisheries Society 115:529-536, 1986.

RELATED PUBLICATIONS

Other project reports and related publications available through the professional literature or from the Bonneville Power Administration (BPA) Public Information Center - CKPS-1, P.O. Box 3621, Portland, OR. 97208-3621

1999

Martinson, R. D., G. M. Kovalchuk, D. Ballinger, and J. W. Kamps. 1999. Monitoring of downstream salmon and steelhead at federal hydroelectric facilities - 1999. Pacific States Marine Fisheries Commission, Gladstone, OR. 1999 Annual Report (DOE/BP-20733-11) to BPA, Project 87-127, Contract DE-AI79-85BP20733. 64p.

1998

Martinson, R. D., G. M. Kovalchuk, R. B. Mills, and J. W. Kamps. 1998. Monitoring of downstream salmon and steelhead at federal hydroelectric facilities - 1996. U.S. Dept. of Comm. , NOAA, NMFS, ETSD, Portland, OR. 1997 Annual Report (DOE/BP-20733-11) to BPA, Project 84-014, Contract DE-AI79-85BP20733. 64p.

1997

Martinson, R. D., R. J. Graves, R. B. Mills, and J. W. Kamps. 1997. Monitoring of downstream salmon and steelhead at federal hydroelectric facilities - 1996. U.S. Dept. of Comm., NOAA, NMFS, ETSD, Portland, OR. 1996 Annual Report (DOE/BP-20733-11) to BPA, Project 84-014, Contract DE-AI79-85BP20733. 64p.

1996

Martinson, R. D., R. J. Graves, M. J. Langeslay, and S. D. Killins. 1996. Monitoring of downstream salmon and steelhead at federal hydroelectric facilities - 1995. U.S. Dept. of Comm. , NOAA, NMFS, ETSD, Portland, OR. 1995 Annual Report (DOE/BP-20733-10) to BPA, Project 84-014, Contract DE-AI79-85BP20733. 16p. plus Appendices.

Brege, D. A., R. F. Absolon, and R. J. Graves. 1996. Seasonal and diel passage of juvenile salmonids at John Day Dam on the Columbia River. North American Journal of Fisheries Management 16: 659-665.

1995

Martinson, R. D., R. J. Graves, M. J. Langeslay, L. A. Wood, and S. D. Killins. 1995. Monitoring of downstream salmon and steelhead at federal hydroelectric facilities - 1994. U.S. Dept. of Comm. , NOAA, NMFS, ETSD, Portland, OR. 1994 Annual Report (DOE/BP-20733-9b) to BPA, Project 84-014, Contract DE-AI79-85BP20733. 25p. plus Appendices.

1994

Wood, L. A., R. D. Martinson, R. J. Graves, D. R. Carroll, and S. D. Killins. 1994. Monitoring of downstream salmon and steelhead at federal hydroelectric facilities - 1993. U.S. Dept. of Comm. , NOAA, NMFS, ETSD, Portland, OR. 1993 Annual Report (DOE/BP-20733-9) to BPA, Project 84-014, Contract DE-AI79-85BP20733. 26p. plus Appendices.

1993

Hawkes, L. A., R. D. Martinson, R. F. Absolon, and S. D. Killins. 1993. Monitoring of downstream salmon and steelhead at federal hydroelectric facilities - 1992. U.S. Dept. of Comm. , NOAA, NMFS, ETSD, Portland, OR. 1992 Annual Report (DOE/BP-20733-8) to BPA, Project 84-014, Contract DE-AI79-85BP20733. 20p. plus Appendices.

1992

Hawkes, L. A., R. D. Martinson, and W. W. Smith. 1992. Monitoring of downstream salmon and steelhead at federal hydroelectric facilities - 1991. U.S. Dept. of Comm. , NOAA, NMFS, ETSD, Portland, OR. 1991 Annual Report (DOE/BP-20733-7) to BPA, Project 84-014, Contract DE-AI79-85BP20733. 19p. plus Appendices.

1991

Hawkes, L. A., R. C. Johnsen, W. W. Smith, R. D. Martinson, W. A. Hevlin, and R. F. Absolon. 1991. Monitoring of downstream salmon and steelhead at federal hydroelectric facilities - 1990. U.S. Dept. of Comm., NOAA, NMFS, ETSD, Portland, OR. 1990 Annual Report (DOE/BP-20733-6) to BPA, Project 84-014, Contract DE-AI79-85BP20733. 20p. plus Appendices.

1990

Johnsen, R. C., Lynette A. Hawkes, W. W. Smith, G. L. Fredricks, R. D. Martinson, and W. A. Hevlin. 1990. Monitoring of downstream salmon and steelhead at federal hydroelectric facilities - 1989. U.S. Dept. of Comm., NOAA, NMFS, ETSD, Portland, OR. 1989 Annual Report (DOE/BP-20733-5) to BPA, Project 84-014, Contract DE-AI79-85BP20733. 18p. plus Appendices.

1988

Johnsen, R. C., Lynette A. Hawkes, W. W. Smith, G. L. Fredricks. 1988. Monitoring of downstream salmon and steelhead at federal hydroelectric facilities - 1988. U.S. Dept. of Comm. , NOAA, NMFS, ETSD, Portland, OR. 1988 Annual Report (DOE/BP-20733-4) to BPA, Project 84-014, Contract DE-AI79-85BP20733. 14p. plus Appendices.

1987

Johnsen, R. C., Lynette A. Wood, and W. W. Smith. 1987. Monitoring of downstream salmon and steelhead at federal hydroelectric facilities - 1987. U.S. Dept. of Comm., NOAA, NMFS, ETSD, Portland, OR. 1987 Annual Report (DOE/BP-20733-3) to BPA, Project 84-014, Contract DE-AI79-85BP20733. 10p. plus Appendices.

1986

Johnsen, R. C., Lynette A. Wood, and W. W. Smith. 1986. Monitoring of downstream salmon and steelhead at federal hydroelectric facilities - 1986. U.S. Dept. of Comm., NOAA, NMFS, ETSD, Portland, OR. 1986 Annual Report (DOE/BP-20733-2) to BPA, Project 84-014, Contract DE-AI79-85BP20733. 11. plus Appendices.

1985

Johnsen, R. C. and C. L. Ranck. 1985 Monitoring of downstream salmon and steelhead at federal hydroelectric facilities - 1985. S. Dept. of Comm., NOAA, NMFS, ETSD, Portland, OR. 1985 Annual Report (DOE/BP-20733-1) to BPA, Project 84-014, Contract DE-AI79-85BP20733. 7p. plus Appendix.

1984

Johnsen, R. C., C. W. Sims, D. A. Brege, and A. E. Giorgi. 1984. Monitoring of downstream salmon and steelhead at federal hydroelectric facilities - 1984. S. Dept. of Comm., NOAA, NMFS, CZES, Seattle, WA. 1984 Annual Report (DOE/BP-17265) to BPA, Project 84-014, Contract DE-AI79-84BP17265. 6p.

APPENDIX

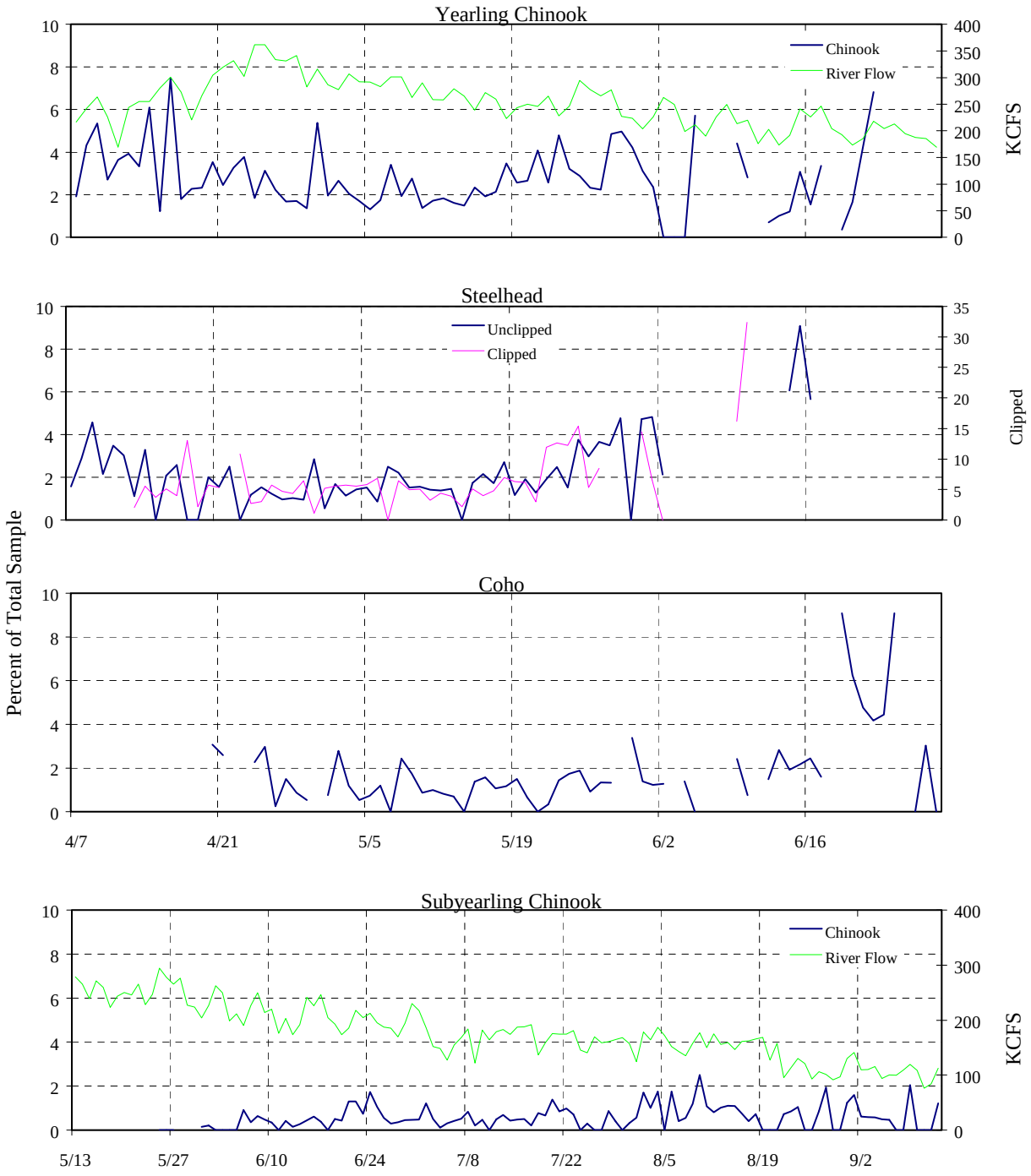

Figure A-1. John Day daily descaling and river flow. Days with sample size of less than 30 have been excluded.

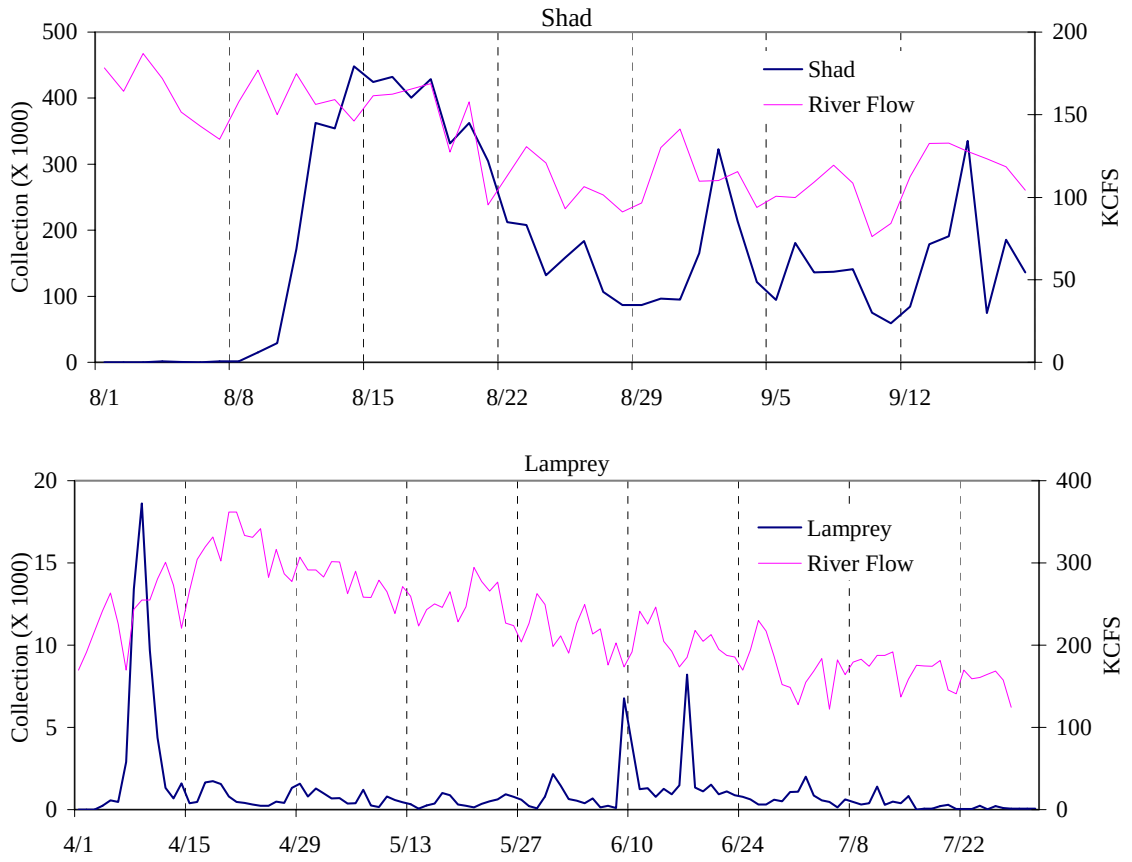

Figure A-2. John Day daily shad and lamprey passage.

Table A-1. John Day current year PIT tag summary.

Migration Year	Species	Run	Rear	Observations	Species Totals	Migration Year Totals
1999	Chinook	Spring	Wild	465	465 Chinook	
	Steelhead	Summer	Wild	7	7 Steelhead	**472**
2000	Unknown	Unknown	Unknown	21	21 Unknown	
	Chinook	Spring	Hatchery	4,420		
	Chinook	Spring	Unknown	28		
	Chinook	Spring	Wild	1,973		
	Chinook	Summer	Hatchery	5,782		
	Chinook	Summer	Wild	1,023		
	Chinook	Fall	Hatchery	4,375		
	Chinook	Fall	Unknown	3,762		
	Chinook	Fall	Wild	541		
	Chinook	Unknown	Hatchery	1,472		
	Chinook	Unknown	Unknown	254		
	Chinook	Unknown	Wild	3,331	26,961 Chinook	
	Coho	Spring	Hatchery	22		
	Coho	Spring	Unknown	2		
	Coho	Fall	Hatchery	780		
	Coho	Fall	Unknown	1		
	Coho	Fall	Wild	12	817 Coho	
	Steelhead	Summer	Hatchery	8,070		
	Steelhead	Summer	Unknown	1		
	Steelhead	Summer	Wild	5,383	13,454 Steelhead	
	Sockeye	Summer	Hatchery	26		
	Sockeye	Summer	Wild	7		
	Sockeye	Unknown	Unknown	47		
	Sockeye	Unknown	Wild	43	123 Sockeye	**41,376**
			Total Observations at John Day Dam:			**41,848**

Species Summary	Chinook	Coho	Steelhead	Sockeye	Unknown
Number	27,426	817	13,461	123	21
Percentage	66%	1.9%	32%	0.3%	0.1%

Table A-2. John Day current year mark recapture data.

Elastomer Tags

Species	Location	Color	Release Site	Release Number	Number Recaptured
Yearling	Left	Blue	Snake River	150,000	441[1]
Fall	Left	Green	Clearwater River	150,000	796
Chinook	Left	Red	Snake River	450,000	5,532
	Right	Red			90[2]
	Right	Green	Snake River	150,000	432
	Left	Green	Wenatchee River	45,000	16
Summer	Left	Orange	Wenatchee River	30,000	17
Steelhead	Right	Green	Wenatchee River	43,400	68
	Right	Orange	Wenatchee River	30,600	32[3]
	Right	Red	Wenatchee River	25,600	42[4]
				Total Elastomer Tags=	**7,468**

Freeze Brands

Species	Location*	Code	Orient.	Release Site	Release Number	Number Recaptured
	LA	F	1,2	Methow River	68,000	4
Summer	LA	2	2	Touchet River	40,380	137
Steelhead	LA	IC	1,2,3	Tucannon River	40,521	53
	RA	7	3	Unknown	?	1
	RA	T	1	Clearwater River	10,000	1
	RA	2	2	Grande Ronde River	80,279	18
	RA	IC	1,3	Snake River	20,179	70
					Total Freeze Brands=	**284**

* LA = left anterior, RA = right anterior

[1] Three of these tags were recorded on the right side of the fish.
[2] These fish did not match any reported release group. It is possible that these were from Lyons Ferry Clipped releases in the Snake River, but this could not be verified.
[3] One of these brands was recorded as a yearling fall chinook.
[4] Two of these tags were recorded on the left side of the fish.

Table A-3 John Day sampling interruptions .

End Date	Batch #	Reason for interruption	Hours missed
13-April	00104	3-way rotating gate testing	1:00
17-July	00199	Sample put into bypass instead of normal	4:00
		Minimum total sample hours missed =	5:00

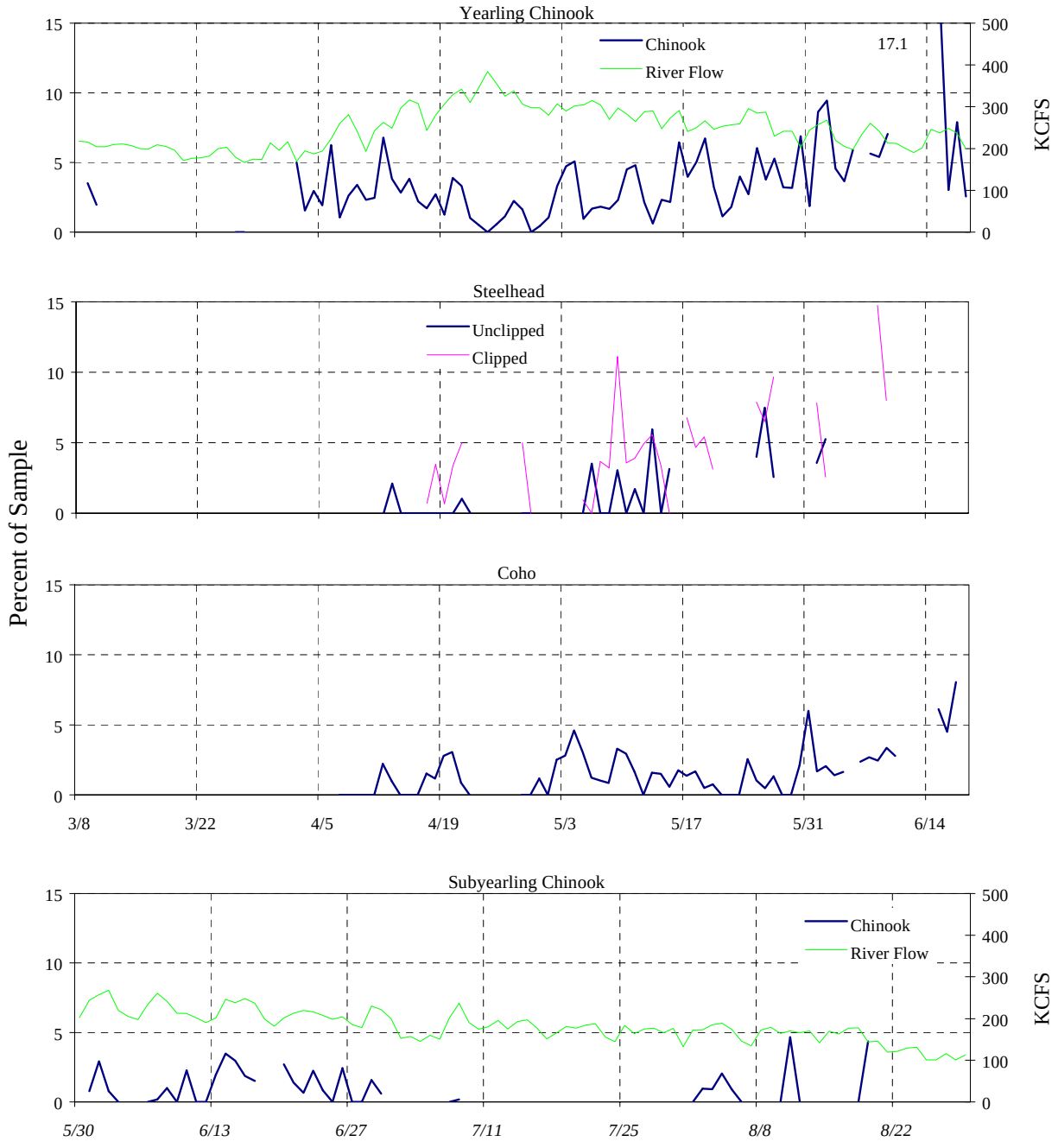

Figure B-1. PH2 daily percent descaling and river flow. Days with sample size of less than 30 have been excluded.

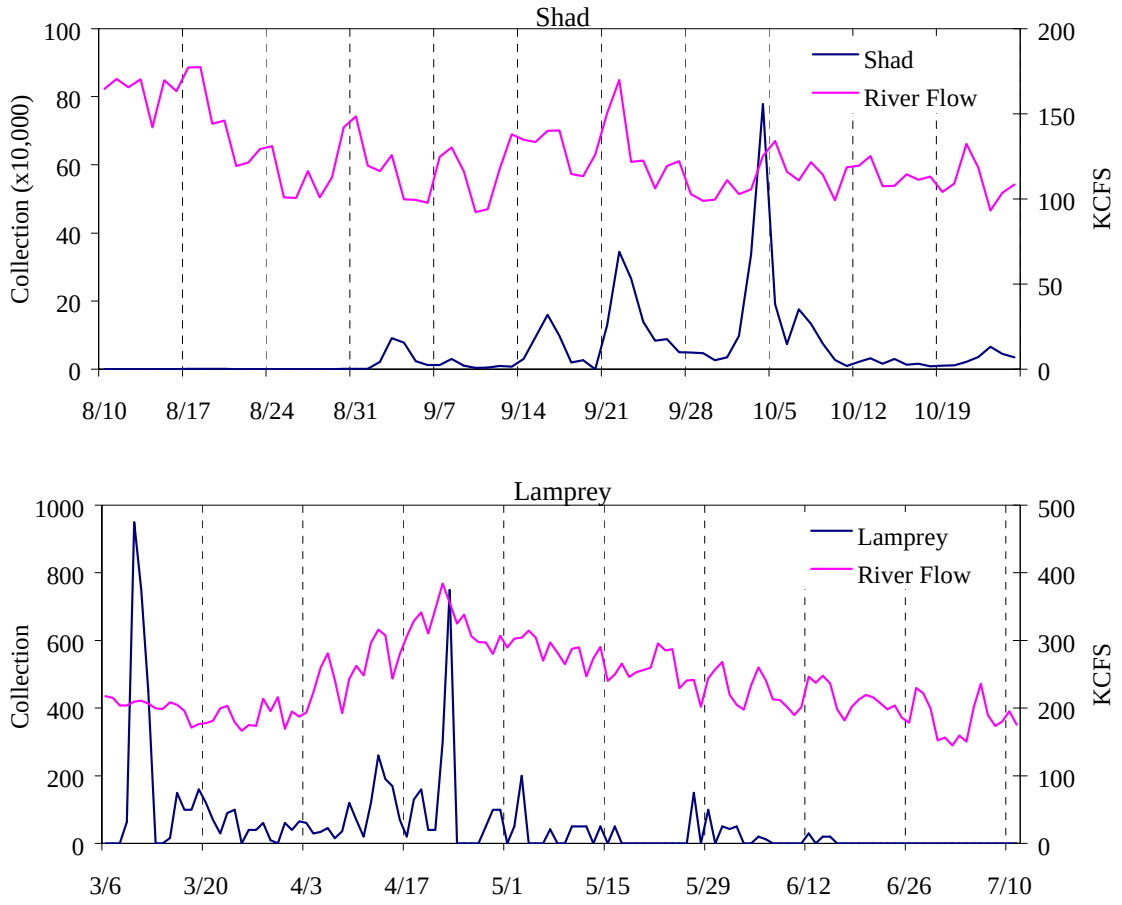

Figure B-2. PH2 daily shad and lamprey passage.

Table B-1. Bonneville Dam current year PIT tag detections.

Migration Year	Site	Chinook											Steelhead	
		Hatchery				Unknown			Wild				Hatchery	Wild
		FA	SP	SU	UN	FA	SP	UN	FA	SP	SU	UN	SU	SU
1999	B2J									117	1			1
	BVX									120				4
Total 1999										**237**	**1**			**5**
2000	B2J	857	8,190	3,680	2,670	1,820	8,626	130	4	1,314	801	2,933	4,964	3,486
	BVX	1,207	4,637	1,746	1,607	4,873	9,415	62	54	944	751	2,512	4,348	4,443
Total 2000		**2,064**	**12,827**	**5,426**	**4,277**	**6,693**	**18,041**	**192**	**58**	**2,258**	**1,552**	**5,445**	**9,312**	**7,929**
Season	B2J	857	8,190	3,680	2,670	1,820	8,626	130	4	1,431	802	2,933	4,964	3,487
Total	BVX	1,207	4,637	1,746	1,607	4,873	9,415	62	54	1,064	751	2,512	4,348	4,447
Totals		**2,064**	**12,827**	**5,426**	**4,277**	**6,693**	**18,041**	**192**	**58**	**2,495**	**1,553**	**5,445**	**9,312**	**7,934**

Migration Year	Site	Sockeye						Coho					Unknown	
		Hatchery		Wild		Unknown		Hatchery			Wild	Unknown	Unknown	
		SU	UN	SU	UN	SU	UN	FA	SP	FA	FA	SP	UN	**Totals**
1999	B2J													119
	BVX													124
Total 1999														**243**
2000	B2J	45	1	4	14	635	11	404	3	8	1	5,594	12	46,207
	BVX	36	1	3	6		10	294	6	4		3,416	17	40,392
Total 2000		**81**	**2**	**7**	**20**	**635**	**21**	**698**	**9**	**12**	**1**	**9,010**	**29**	**86,599**
Season	B2J	45	1	4	14	635	11	404	3	8	1	5,594	12	46,326
Total	BVX	36	1	3	6	0	10	294	6	4	0	3,416	17	40,516
Totals		**81**	**2**	**7**	**20**	**635**	**21**	**698**	**9**	**12**	**1**	**9,010**	**29**	**86,842**

Sp=Spring, SU=Summer, FA=Fall, UN=unknown

BVX=Bonneville first powerhouse, B2J=Bonneville second powerhouse

Table B-2. PH1 current year mark recapture data.

Elastomer Tags

Species	Location	Color	Release Site	Release Number	Number Recaptured
Yearling Fall Chinook	Left	Blue	Snake River	150,000	3
	Left	Green	Clearwater River Middle Fork	150,000	5
	Left	Red	Snake River	450,000	49
	Right	Red			3[1]
	Right	Green	Snake River	150,000	8
Yearling Summer Chinook	Right	Red	South Fork Salmon River	79,000	3
Summer Steelhead	Left	Green	Wenatchee River	45,000	1
	Left	Orange	Wenatchee River	30,000	4
	Right	Green	Wenatchee River	43,400	3
	Right	Orange	Wenatchee River	30,600	4
	Right	Red	Wenatchee River	25,600	2
				Total Elastomer tags =	**85**

* LA= left anterior, RA = right anterior

[1] These fish did not match any reported release group. It is possible that these were from Lyons Ferry clipped releases in the Snake River, but this could not be verified.

Table B-3. PH2 current year mark recapture data.

Elastomer Tags

Species	Location	Color	Release Site	Release Number	Number Recaptured
Yearling Fall Chinook	Left	Blue	Snake River	150,000	21
	Left	Green	Clearwater River Middle Fork	150,000	25
	Left	Red	Snake River	450,000	203
	Right	Red			7[1]
	Right	Green	Snake River	150,000	19
Yearling Summer Chinook	Right	Red	South Fork Salmon River	79,000	3
Summer Steelhead	Left	Green	Wenatchee River	45,000	5
	Left	Orange	Wenatchee River	30,000	2
	Right	Green	Wenatchee River	43,400	8
	Right	Orange	Wenatchee River	30,600	7
	Right	Red	Wenatchee River	25,600	7
				Total Elastomer tags =	**307**

Freeze Brands

Species	Location*	Code	Orient.	Release Site	Release number	Number Recaptured
Summer Steelhead	LA	2	2	Touchet River	40,380	5
	LA	IC	1,3	Toucannon River	40,521	2
	RA	2	2	Grande Ronde River	80,279	1
	RA	IC	1	Snake River	20,179	3
					Total Freeze Brands =	**11**

* LA= left anterior, RA = right anterior

[1] These fish did not match any reported release group. It is possible that these were from Lyons Ferry clipped releases in the Snake River, but this could not be verified.

Table B-4. PH2 sampling interruptions.

Date	Batch Number	Reason for Outage	Hours Missed
26-Aug	00226	Installation of modified switchgate seals.	24
27-Aug	00227	Installation of modified switchgate seals.	10
20 Sept	00264	Repairs undertaken to sample tank crowder	24
		Total hours missed	**58**

Table B-5. PH1 gas bubble trauma (GBT) examination summary.

			Incidence of Gas Bubble Trauma symptoms						
			% of monthly sample*				Smolt Affected		Monthly %
Month	**Species**	**Sample Size**	Lateral line	Eyes	unpaired fins ranks 1 and 2	unpaired fins ranks 3 and 4	Number	Percent	of Season Totals
April	Spring Chinook	663	0.00%	0.00%	0.00%	0.00%	0	0.00%	0.00%
	Unclipped Steelhead	289	0.15%	0.00%	0.00%	0.00%	1	0.00%	9.09%
	Clipped Steelhead	209	0.00%	0.00%	0.00%	0.00%	0	0.00%	0.00%
Monthly Total		1161	0.00%	0.00%	0.00%	0.00%	1	0.09%	**9.09%**
May	Spring Chinook	900	0.00%	0.00%	0.00%	0.00%	0	0.00%	0.00%
	Unclipped Steelhead	444	0.45%	0.00%	0.00%	0.00%	2	0.45%	18.18%
	Clipped Steelhead	456	0.22%	0.00%	0.00%	0.00%	1	0.22%	9.09%
Monthly Total		1800	0.26%	0.00%	0.00%	0.00%	3	0.17%	**27.27%**
June	Spring Chinook	200	0.50%	0.00%	0.00%	0.00%	1	0.50%	9.09%
	Fall Chinook	600	0.00%	0.00%	0.00%	0.00%	0	0.00%	0.00%
	Unclipped Steelhead	144	0.00%	0.00%	0.00%	0.00%	0	0.00%	0.00%
	Clipped Steelhead	173	1.16%	0.00%	0.58%	0.00%	2	1.16%	18.18%
Monthly Total		917	0.27%	0.00%	0.09%	0.00%	3	0.33%	**27.27%**
July	Fall Chinook	800							
Monthly Total		800	0.38%	0.00%	0.00%	0.00%	3	0.38%	**27.27%**
August	Fall Chinook	683							
Monthly Total		683	0.15%	0.00%	0.00%	0.00%	1	0.15%	**9.09%**
Season Totals	Spring Chinook	1563	0.06%	0.00%	0.00%	0.00%	1	0.06%	
	Fall Chinook	2083	0.19%	0.00%	0.00%	0.00%	4	0.19%	
	Unclipped Steelhead	877	0.34%	0.00%	0.00%	0.00%	3	0.34%	
	Clipped Steelhead	838	0.36%	0.00%	0.12%	0.00%	3	0.36%	
Season Total		5361	0.20%	0.00%	0.02%	0.00%	**11**	**0.21%**	
Total number of symptoms in each location			11	0	1	0	12		
% of symptoms in each location			91.7%	0.0%	8.3%	0.0%			

NOTE: GBT symptoms were ranked as follows: 0 = 0% coverage, 1 = 1-5% coverage, 2 = 6-25% coverage, 3 = 26-50% coverage, and 4 = greater than 50% coverage.

* some smolt exhibited symptoms in multiple locations

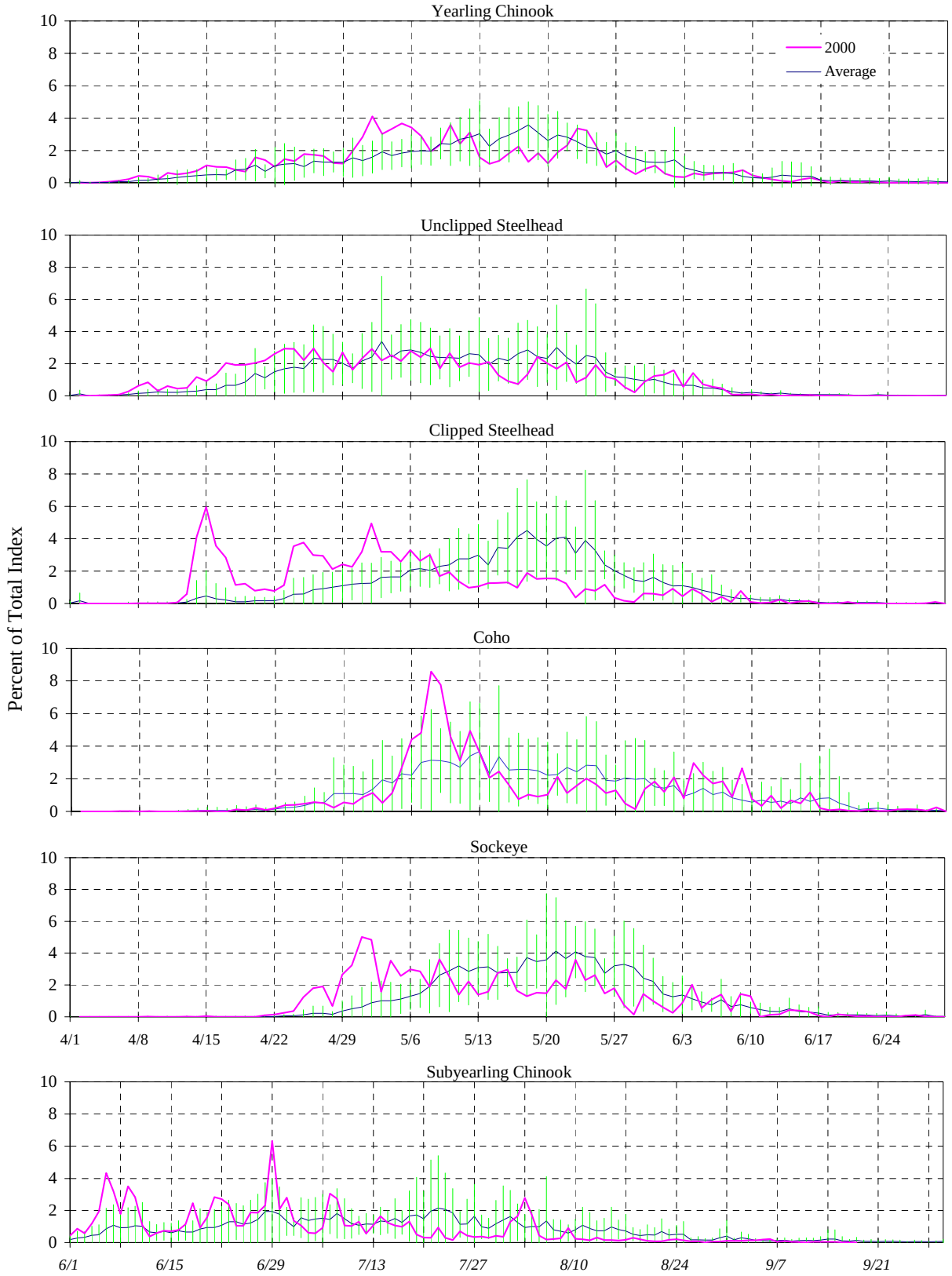

Figure C-1. John Day average daily passage with standard deviation, 1985-2000.

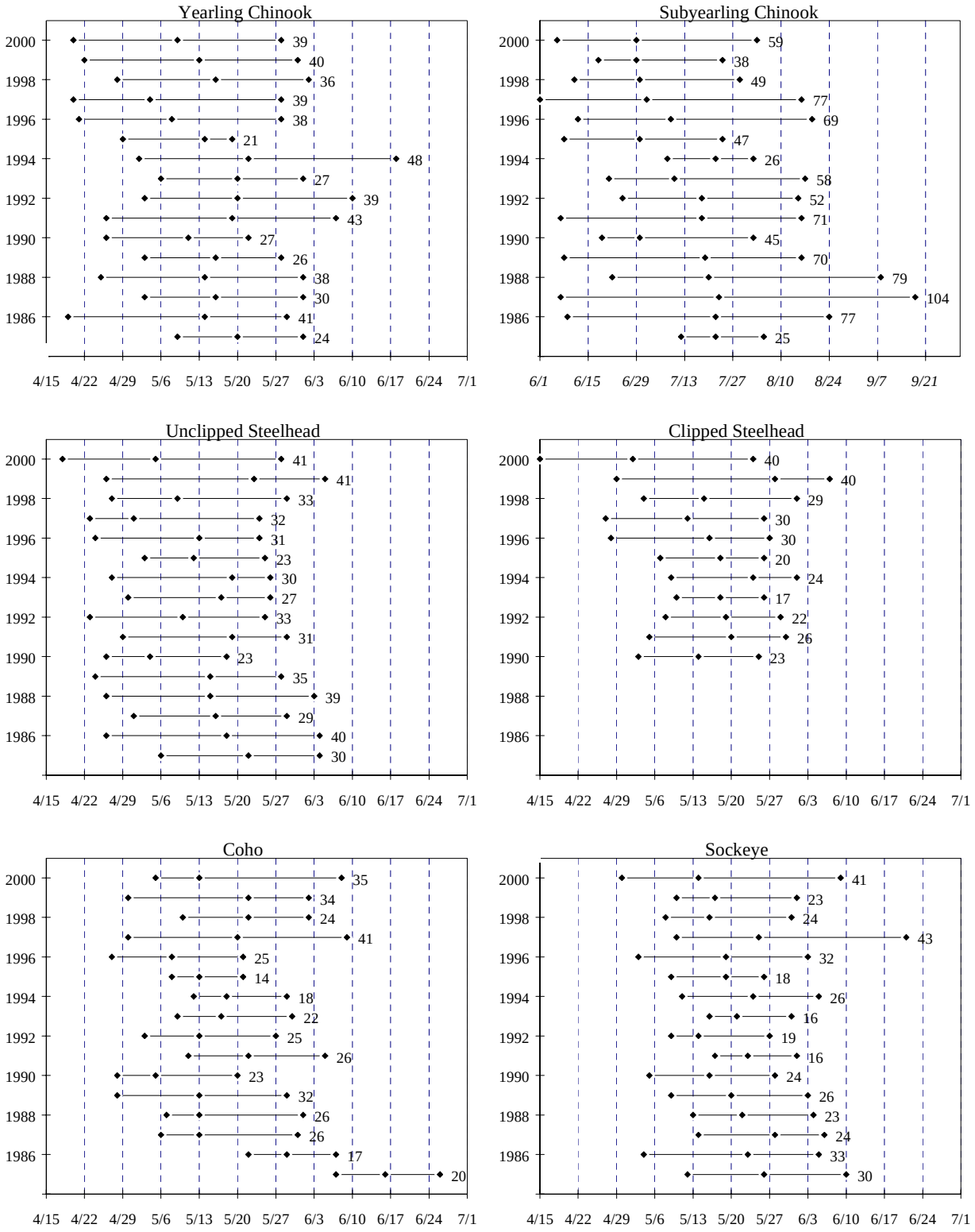

Figure C-2. John Day 10%, 50%, and 90% passage dates by species, 1985-2000. The number of days between 10-90% dates is indicated for each line. Clipped and unclipped steelhead were not differentiated before 1990.

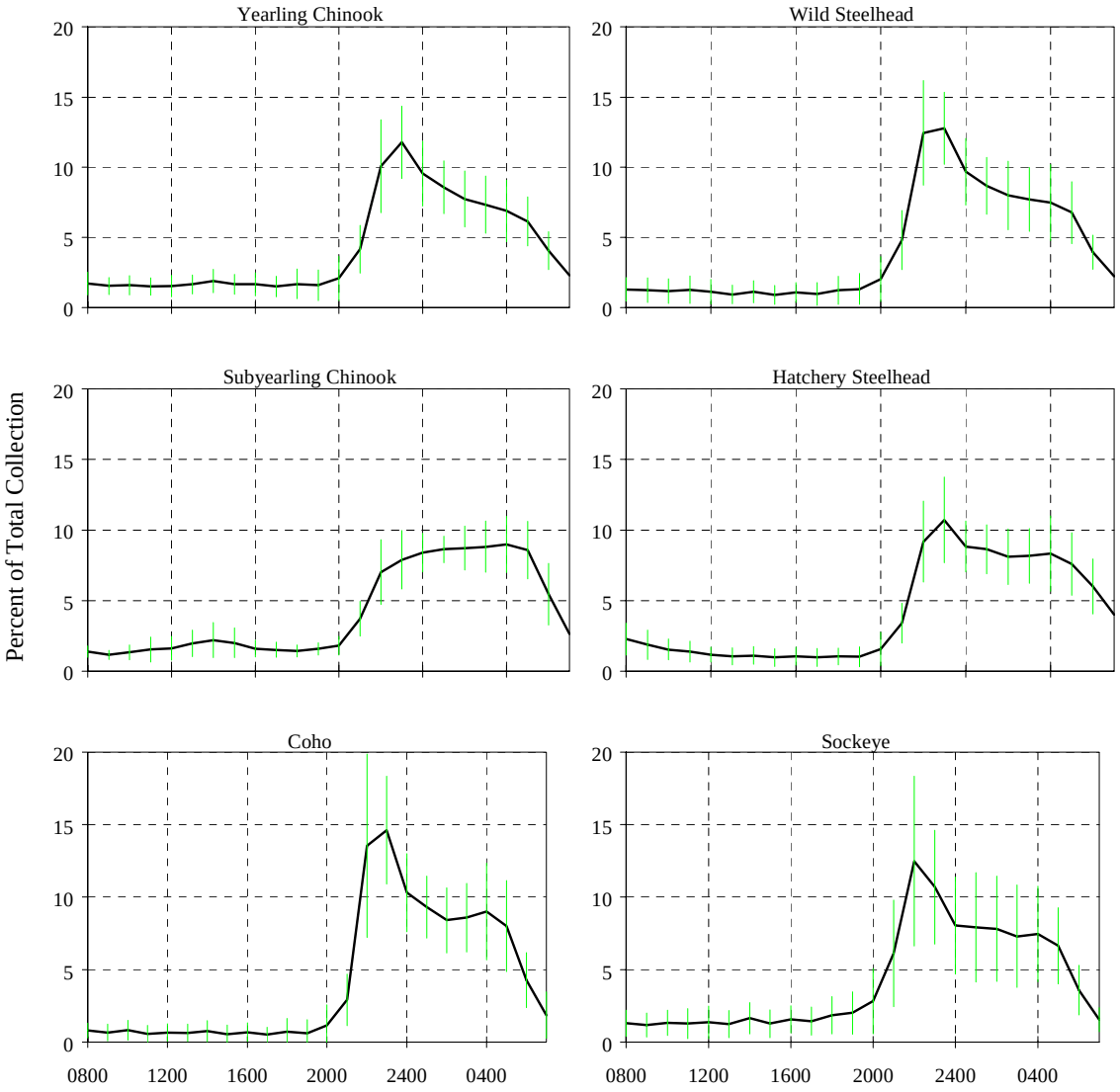

Figure C-3. John Day average diel passage with standard deviation, 1985-1997. Collection of hourly detail ceased in 1998.

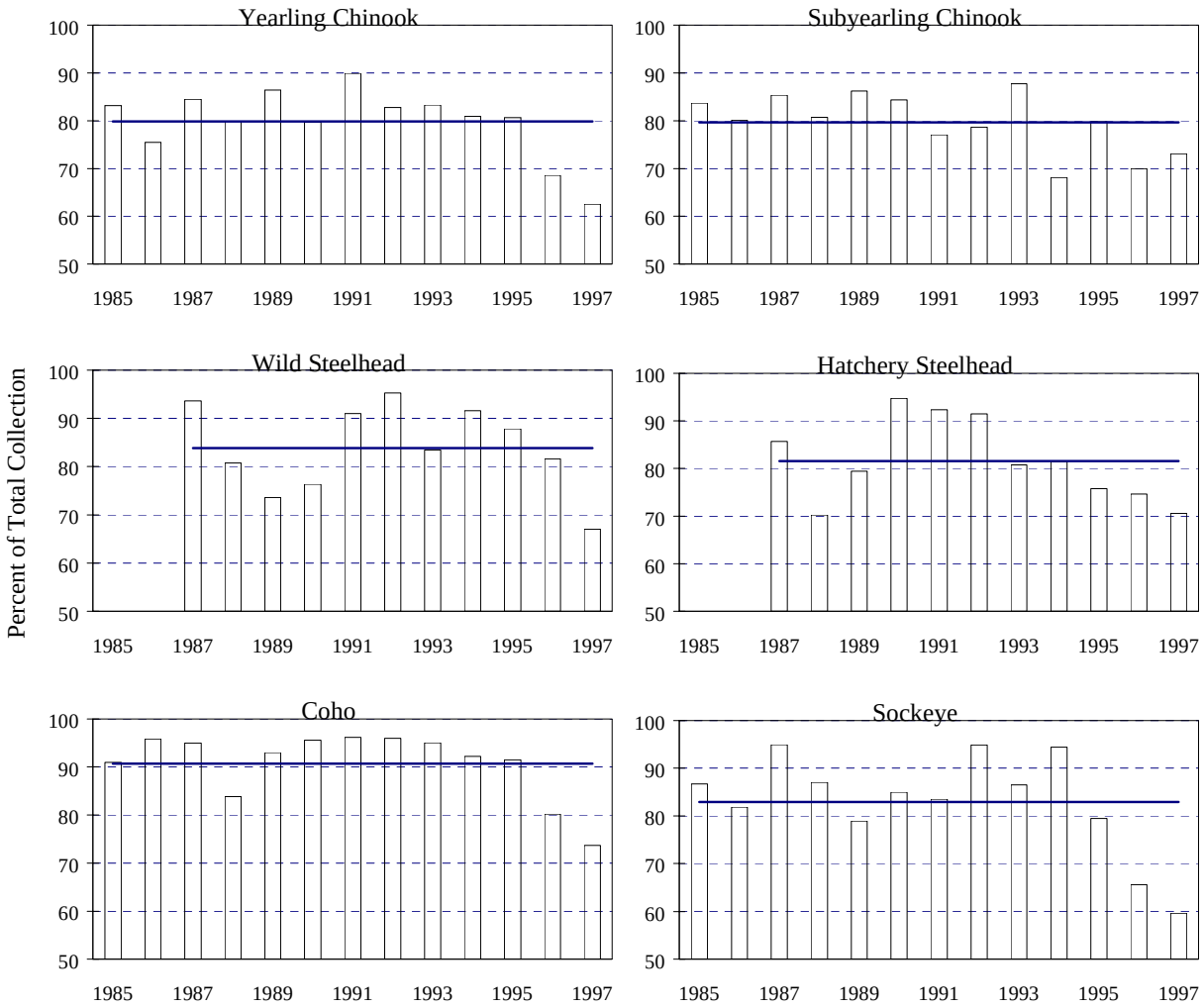

Figure C-4. John Day percent night passage (1800-0600 hours) by species, 1985-1997. Horizontal line is average for all years,. Collection of hourly detail ceased in 1998.

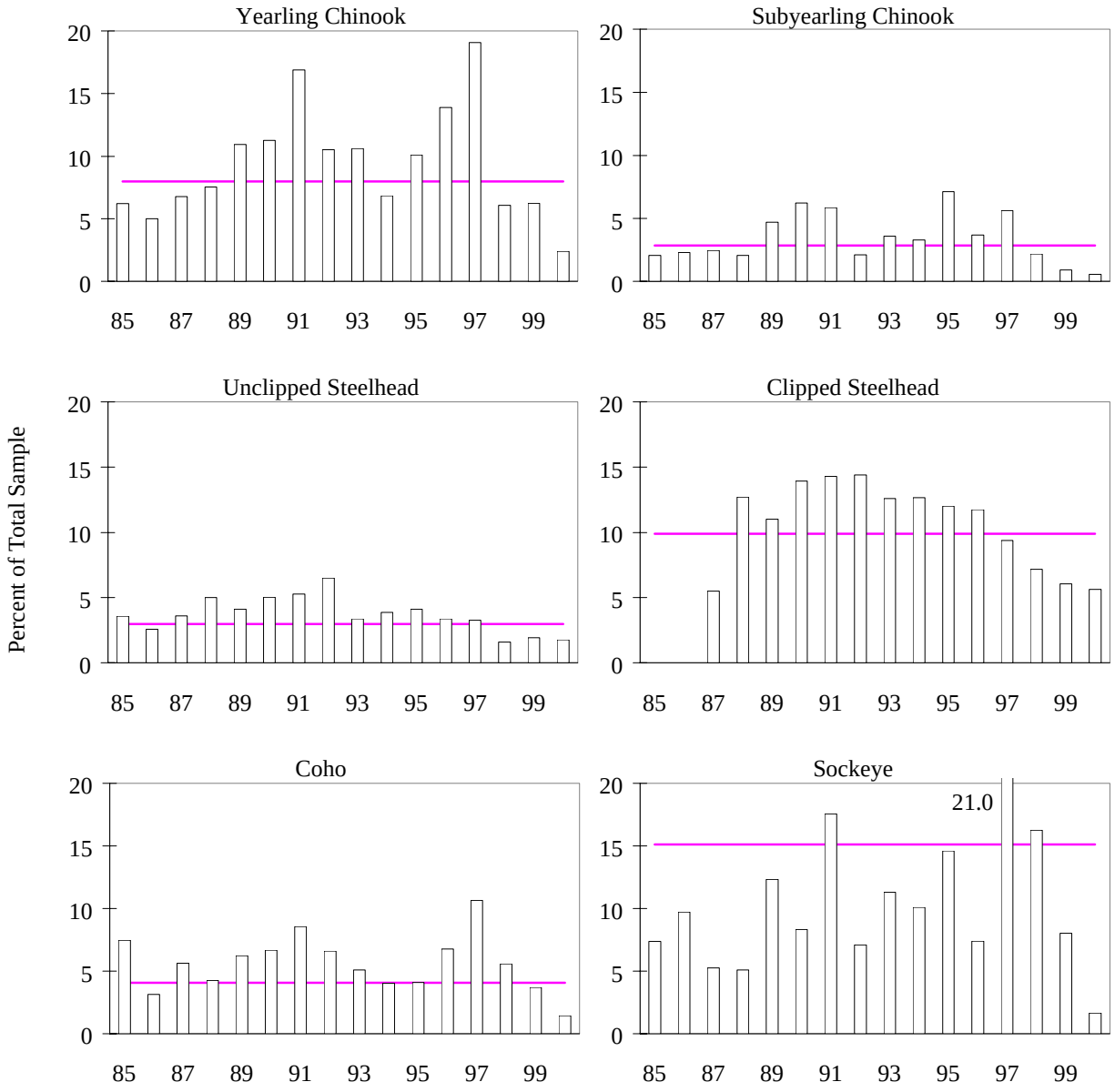

Figure C-5. John Day annual descaling rates, 1985-2000. Clipped and unclipped steelhead were not differentiated before 1987.

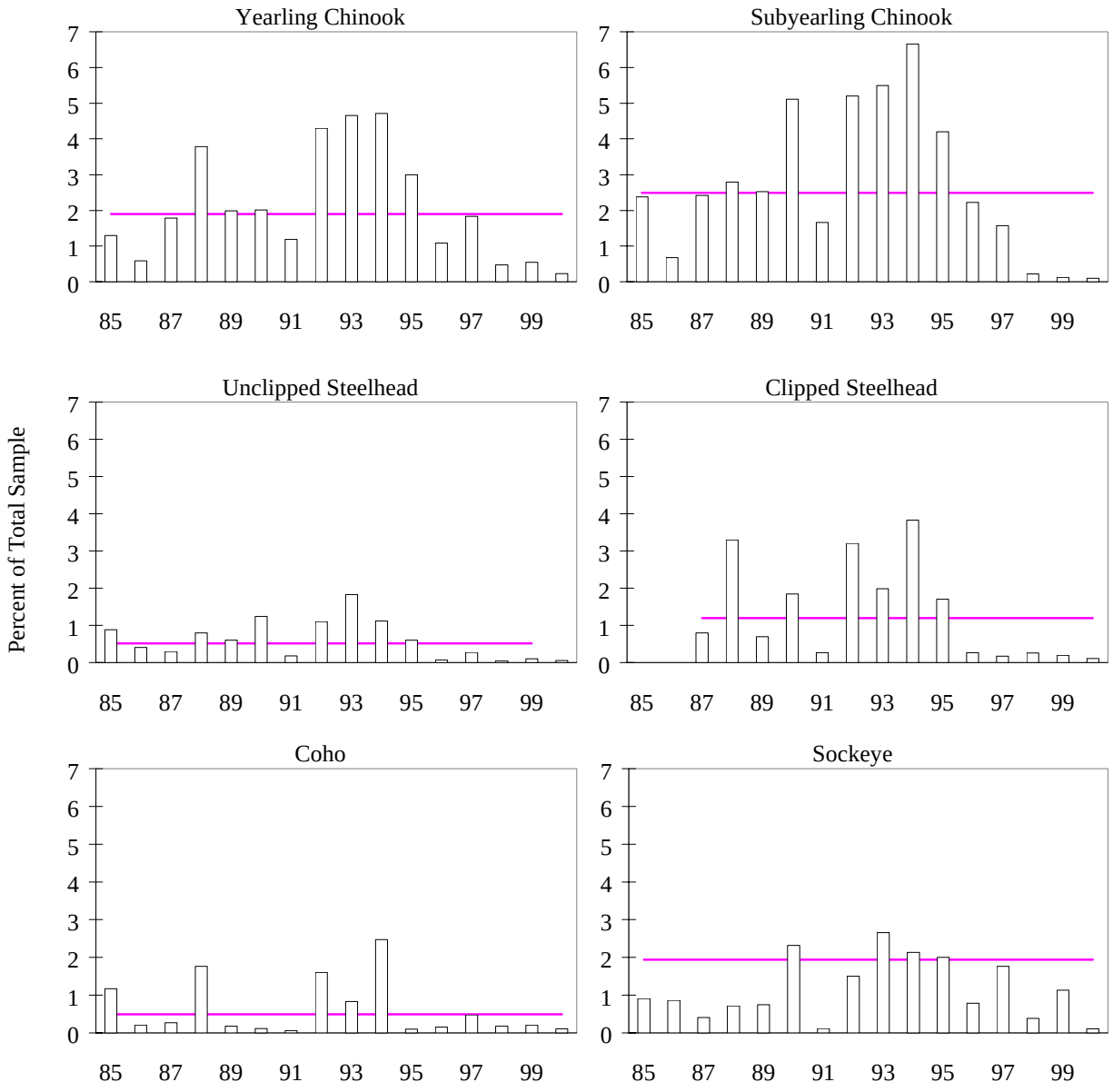

Figure C-6. John Day annual mortality rates, 1985-2000. Clipped and unclipped steelhead were not differentiated before 1987.

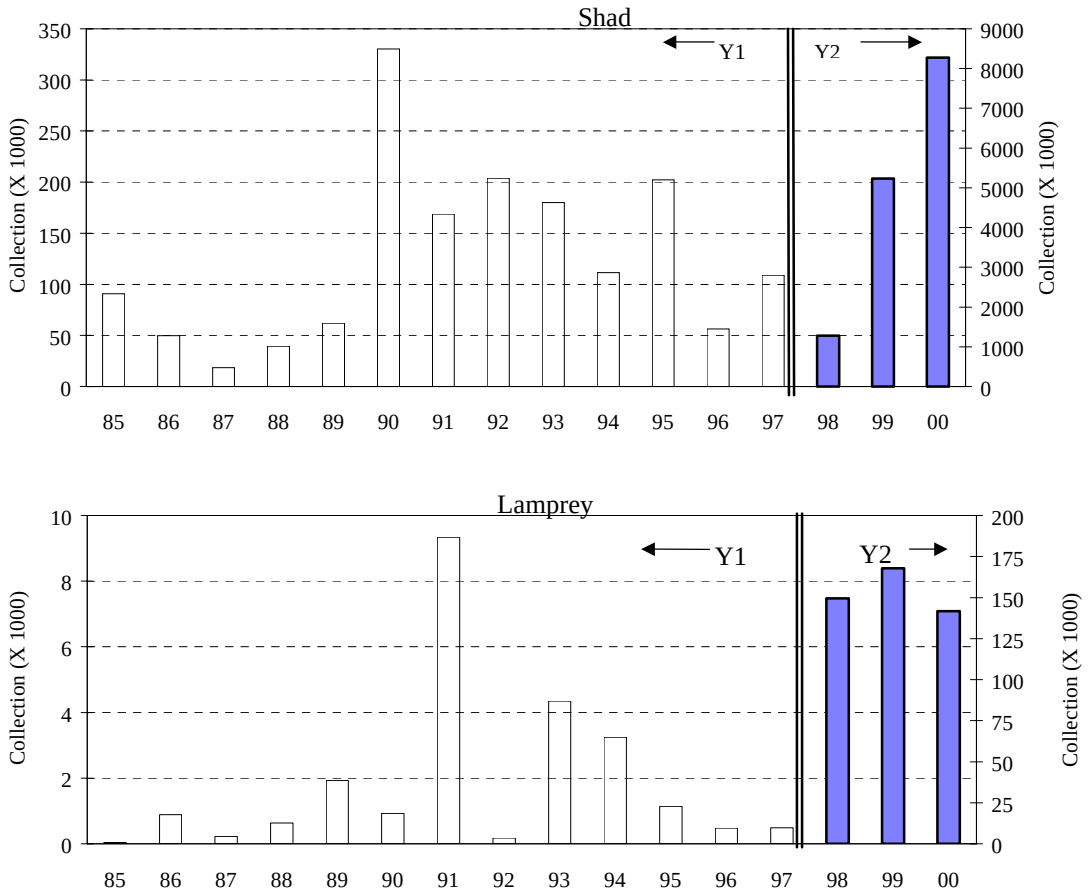

Figure C-7. John Day annual shad and lamprey totals, 1985-2000.

Table C-1. John Day percent night passage (1800-0600), 1985-1997. Collection of hourly detail ceased in 1998.

YEAR	Yearling Chinook	Subyearling Chinook	Unclipped Steelhead	Clipped Steelhead	Coho	Sockeye
1985	83.2	83.7	N/A	N/A	91.0	86.8
1986	75.5	80.1	N/A	N/A	95.9	81.9
1987	84.5	85.4	93.6	85.6	95.0	94.9
1988	80.0	80.7	80.8	70.3	83.9	87.1
1989	86.4	86.2	73.6	79.4	93.0	79.0
1990	79.7	84.4	76.3	94.8	95.6	85.0
1991	89.9	77.0	91.0	92.3	96.2	83.6
1992	82.8	78.7	95.3	91.5	96.0	94.9
1993	83.3	87.8	83.4	80.7	95.1	86.5
1994	80.9	68.1	91.6	81.4	92.2	94.5
1995	80.7	79.7	87.9	75.8	91.5	79.5
1996	68.6	70.0	81.6	74.7	80.2	65.6
1997	62.6	73.1	67.0	70.6	73.7	59.6
AVERAGE	79.8	79.6	83.8	81.5	90.7	83.0
MIN	62.6	68.1	67.0	70.3	73.7	59.6
MAX	89.9	87.8	95.3	94.8	96.2	94.9

Table C-2. John Day 10%, 50%, and 90% passage dates with duration of middle 80% in days, 1985 to 2000.

Yearling Chinook				
	10 %	50%	90 %	# of Days
1985^	9-May	20-May	1-Jun	24
1986	19-Apr	14-May	29-May	41
1987	3-May	16-May	1-Jun	30
1988	25-Apr	14-May	1-Jun	38
1989	3-May	16-May	28-May	26
1990^	26-Apr	11-May	22-May	27
1991	26-Apr	19-May	7-Jun	43
1992	3-May	20-May	10-Jun	39
1993	6-May	20-May	1-Jun	27
1994	2-May	22-May	18-Jun	48
1995	29-Apr	14-May	19-May	21
1996	21-Apr	8-May	28-May	38
1997	20-Apr	4-May	28-May	39
1998	28-Apr	16-May	2-Jun	36
1999	22-Apr	13-May	31-May	40
2000	20-Apr	9-May	28-May	39
MEDIAN	27-Apr	15-May	31-May	36
MIN	19-Apr	4-May	19-May	21
MAX	9-May	22-May	18-Jun	48

Subyearling Chinook				
	10 %	50%	90 %	# of Days
1985^	12-Jul	22-Jul	5-Aug	25
1986	9-Jun	22-Jul	24-Aug	77
1987	7-Jun	23-Jul	18-Sep	104
1988	22-Jun	20-Jul	8-Sep	79
1989	8-Jun	19-Jul	16-Aug	70
1990^	19-Jun	30-Jun	2-Aug	45
1991	7-Jun	18-Jul	16-Aug	71
1992	25-Jun	18-Jul	15-Aug	52
1993	21-Jun	10-Jul	17-Aug	58
1994	8-Jul	22-Jul	2-Aug	26
1995	8-Jun	30-Jun	24-Jul	47
1996	12-Jun	9-Jul	19-Aug	69
1997	1-Jun	2-Jul	16-Aug	77
1998	11-Jun	30-Jun	29-Jul	49
1999	18-Jun	29-Jun	25-Jul	38
2000	6-Jun	29-Jun	3-Aug	59
MEDIAN	11-Jun	14-Jul	15-Aug	66
MIN	1-Jun	29-Jun	24-Jul	25
MAX	12-Jul	23-Jul	18-Sep	104

Wild Steelhead				
	10 %	50%	90 %	# of Days
1985*^	6-May	22-May	4-Jun	30
1986*	26-Apr	18-May	4-Jun	40
1987*	1-May	16-May	29-May	29
1988*	26-Apr	15-May	3-Jun	39
1989*	24-Apr	15-May	28-May	35
1990^	26-Apr	4-May	18-May	23
1991	29-Apr	19-May	29-May	31
1992	23-Apr	10-May	25-May	33
1993	30-Apr	17-May	26-May	27
1994	27-Apr	19-May	26-May	30
1995	3-May	12-May	25-May	23
1996	24-Apr	13-May	24-May	31
1997	23-Apr	1-May	24-May	32
1998	27-Apr	9-May	29-May	33
1999	26-Apr	23-May	5-Jun	41
2000	18-Apr	5-May	28-May	41
MEDIAN	26-Apr	15-May	28-May	33
MIN	18-Apr	1-May	18-May	23
MAX	6-May	23-May	5-Jun	41

Hatchery Steelhead				
	10 %	50%	90 %	# of Days
1985*^				
1986*				
1987*	ALL STEELHEAD IN WILD			
1988*				
1989*				
1990^	3-May	14-May	25-May	23
1991	5-May	20-May	30-May	26
1992	8-May	19-May	29-May	22
1993	10-May	18-May	26-May	17
1994	9-May	24-May	1-Jun	24
1995	7-May	18-May	26-May	20
1996	28-Apr	16-May	27-May	30
1997	27-Apr	12-May	26-May	30
1998	4-May	15-May	1-Jun	29
1999	29-Apr	28-May	7-Jun	40
2000	15-Apr	2-May	24-May	40
MEDIAN	4-May	18-May	27-May	24
MIN	15-Apr	2-May	24-May	17
MAX	10-May	28-May	7-Jun	40

Coho				
	10 %	50%	90 %	# of Days
1985^	7-Jun	16-Jun	26-Jun	20
1986	22-May	29-May	7-Jun	17
1987	6-May	13-May	31-May	26
1988	7-May	13-May	1-Jun	26
1989	28-Apr	13-May	29-May	32
1990^	28-Apr	5-May	20-May	23
1991	11-May	22-May	5-Jun	26
1992	3-May	13-May	27-May	25
1993	9-May	17-May	30-May	22
1994	12-May	18-May	29-May	18
1995	8-May	13-May	21-May	14
1996	27-Apr	8-May	21-May	25
1997	30-Apr	20-May	9-Jun	41
1998	10-May	22-May	2-Jun	24
1999	30-Apr	22-May	2-Jun	34
2000	5-May	13-May	8-Jun	35
MEDIAN	6-May	15-May	31-May	26
MIN	27-Apr	5-May	20-May	14
MAX	7-Jun	16-Jun	26-Jun	41

Sockeye (Wild + Hatchery)				
	10 %	50%	90 %	# of Days
1985^	12-May	26-May	10-Jun	30
1986	4-May	23-May	5-Jun	33
1987	14-May	28-May	6-Jun	24
1988	13-May	22-May	4-Jun	23
1989	9-May	20-May	3-Jun	26
1990^	5-May	16-May	28-May	24
1991	17-May	23-May	1-Jun	16
1992	9-May	14-May	27-May	19
1993	16-May	21-May	31-May	16
1994	11-May	24-May	5-Jun	26
1995	9-May	19-May	26-May	18
1996	3-May	19-May	3-Jun	32
1997	10-May	25-May	21-Jun	43
1998	8-May	16-May	31-May	24
1999	10-May	17-May	1-Jun	23
2000	30-Apr	14-May	9-Jun	41
MEDIAN	9-May	20-May	3-Jun	26
MIN	30-Apr	14-May	26-May	16
MAX	17-May	28-May	21-Jun	43

^ Years in which the sample unit was out of service (1990: May 30 to June 9, and 1985: April 2 to April 26).

* Years in which no differentiation was made between wild and hatchery steelhead for index purposes.

Table C-3. John Day percent of total passage per hour, 1985-1997. Collection of hourly detail ceased in 1998.

Yearling Chinook

	0800	0900	1000	1100	Noon	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	MID	0100	0200	0300	0400	0500	0600	0700
1985	0.9	1.1	1.3	1.5	1.1	1.6	1.8	1.7	1.5	1.6	1.6	1.3	1.6	4.9	11.3	11.6	10.8	10.1	8.4	7.5	7.1	6.0	2.5	1.0
1986	1.3	1.6	1.9	1.9	1.9	2.0	2.4	2.3	2.7	2.5	2.5	2.4	3.6	8.4	15.3	13.1	7.5	6.0	4.9	4.3	3.5	3.6	2.6	1.4
1987	1.3	1.0	1.0	0.8	0.8	1.8	1.7	1.6	1.1	0.9	1.1	0.9	1.1	2.4	5.5	11.5	11.0	10.3	9.9	8.9	9.5	8.1	5.5	2.4
1988	2.7	2.1	2.4	0.9	0.9	1.0	1.2	1.1	1.2	1.2	1.0	1.2	1.5	4.2	7.2	9.7	7.8	7.5	8.3	9.2	8.1	8.1	7.2	4.2
1989	2.2	1.1	0.8	0.7	0.8	0.7	0.8	0.7	0.9	0.6	0.8	0.7	0.9	2.8	9.1	12.1	10.6	10.2	9.4	9.5	8.9	6.9	5.5	3.6
1990	1.0	1.7	2.0	1.7	2.0	1.9	2.9	1.5	2.2	1.2	1.4	0.8	1.2	4.3	8.6	10.9	9.7	8.6	8.2	7.9	8.2	7.6	3.6	0.7
1991	0.6	0.5	0.8	0.8	0.9	1.0	1.0	1.0	1.0	0.9	0.8	0.9	1.0	3.2	14.9	17.4	13.9	10.2	7.8	6.6	6.1	4.9	2.9	0.7
1992	1.1	1.3	1.3	2.1	1.9	2.1	1.8	1.5	1.2	1.4	0.7	0.6	0.7	2.4	6.0	11.6	11.7	10.8	10.4	9.5	8.8	6.7	3.5	1.0
1993	2.6	1.7	1.4	1.1	1.0	0.9	0.8	0.8	0.8	1.0	1.1	1.1	1.5	2.8	14.8	16.2	10.3	7.8	7.2	6.1	6.1	5.5	3.9	3.4
1994	1.2	1.3	1.2	1.7	1.5	2.1	2.3	1.9	1.8	1.4	1.3	1.1	1.0	4.1	7.9	8.8	8.9	8.7	9.4	9.3	9.4	8.3	4.0	1.4
1995	1.5	2.1	1.2	1.1	1.0	0.9	1.6	1.6	1.2	1.2	1.8	1.9	2.5	3.3	10.6	10.5	9.8	9.6	7.5	7.5	6.5	6.4	4.5	4.2
1996	2.4	2.2	2.4	2.4	2.7	2.6	3.0	2.9	2.2	2.2	3.6	3.7	5.5	5.9	11.1	11.2	6.9	6.8	4.2	4.0	3.2	3.2	2.9	2.7
1997	3.2	2.8	2.9	2.5	3.2	2.6	3.3	2.8	3.6	3.3	4.0	3.8	4.8	5.3	8.4	8.5	5.2	4.7	4.8	4.6	4.3	4.3	3.9	3.3
AVG	1.6	1.5	1.5	1.4	1.3	1.6	1.8	1.7	1.6	1.5	1.7	1.6	2.1	4.4	10.5	11.9	9.6	8.7	7.7	7.2	6.8	6.1	4.0	2.4
MIN	0.6	0.5	0.8	0.7	0.8	0.7	0.8	0.7	0.8	0.6	0.7	0.6	0.7	2.4	5.5	8.5	5.2	4.7	4.2	4.0	3.2	3.2	2.5	0.7
MAX	3.2	2.8	2.9	2.5	3.2	2.6	3.3	2.9	3.6	3.3	4.0	3.8	5.5	8.4	15.3	17.4	13.9	10.8	10.4	9.5	9.5	8.3	7.2	4.2

Subyearling Chinook

	0800	0900	1000	1100	Noon	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	MID	0100	0200	0300	0400	0500	0600	0700
1985	0.8	1.0	1.3	3.1	1.8	1.3	1.6	1.0	0.9	1.1	1.1	1.0	1.2	5.0	12.1	8.1	8.5	8.7	10.1	7.9	8.9	8.0	4.2	1.2
1986	1.9	1.4	1.3	1.4	1.5	2.5	1.6	1.4	1.2	1.3	1.3	1.4	1.4	4.0	5.4	7.9	8.3	8.8	8.6	8.7	9.4	9.2	7.1	3.1
1987	2.0	0.8	0.9	0.7	0.8	0.8	1.0	1.0	1.1	1.1	1.2	2.0	2.1	4.5	6.7	6.5	7.3	8.7	8.3	9.9	10.0	10.8	8.6	3.1
1988	1.7	1.2	1.1	1.1	1.2	1.8	1.8	1.7	1.4	1.5	1.4	2.1	2.2	5.7	7.6	6.5	6.6	7.4	7.9	8.5	9.5	9.3	7.4	3.3
1989	1.8	1.1	1.1	0.7	0.7	0.6	0.7	0.7	0.9	0.8	0.9	1.0	0.9	2.3	3.3	4.4	6.6	8.5	11.6	12.4	12.9	12.8	9.4	3.8
1990	0.9	0.8	0.8	1.2	1.3	1.7	1.8	1.9	1.8	1.2	1.2	1.2	1.4	2.9	7.3	12.1	11.4	10.1	10.0	9.2	8.1	7.2	3.4	1.1
1991	1.0	0.7	0.8	1.0	1.1	3.3	4.7	4.0	1.9	1.7	1.4	1.5	1.6	3.6	7.5	10.0	8.7	8.2	8.0	8.0	8.3	7.9	3.8	1.4
1992	1.1	1.2	1.3	1.6	1.6	2.9	2.4	2.2	2.2	1.9	1.9	2.2	2.7	5.7	6.2	7.0	7.8	7.9	8.6	9.0	10.1	8.5	3.1	1.1
1993	1.1	0.9	0.9	0.7	0.9	0.8	0.7	0.8	0.8	0.7	0.8	1.0	1.1	2.7	4.2	6.0	8.7	10.0	11.1	12.2	12.1	11.3	7.4	3.0
1994	1.5	1.9	2.1	3.3	3.7	3.6	3.7	3.3	2.2	1.9	1.7	1.7	3.2	4.2	6.4	7.0	7.0	7.1	6.1	6.3	7.7	7.1	4.3	3.1
1995	1.1	1.1	1.6	1.1	1.6	1.6	1.9	1.9	1.9	1.8	2.1	2.1	1.8	2.4	10.1	10.5	9.7	10.0	8.2	8.0	6.8	6.7	3.5	2.6
1996	1.6	1.5	2.4	2.3	2.2	2.2	3.1	3.2	2.7	2.7	2.1	2.0	2.2	2.5	6.2	7.9	9.4	8.3	7.6	7.0	6.0	6.0	4.8	4.1
1997	1.5	1.3	2.0	1.9	2.6	2.5	3.7	3.0	1.8	1.8	1.6	1.5	1.8	2.8	8.1	8.8	9.2	8.4	7.5	7.3	7.0	6.6	4.0	3.1
AVG	1.4	1.2	1.3	1.7	1.6	1.8	1.9	1.7	1.4	1.4	1.3	1.5	1.7	3.9	7.4	7.5	8.1	8.6	8.9	8.8	9.3	8.9	5.9	2.7
MIN	0.8	0.7	0.8	0.7	0.7	0.6	0.7	0.7	0.8	0.7	0.8	1.0	0.9	2.3	3.3	4.4	6.6	7.1	6.1	6.3	6.0	6.0	3.1	1.1
MAX	2.0	1.9	2.4	3.3	3.7	3.6	4.7	4.0	2.7	2.7	2.1	2.2	3.2	5.7	12.1	12.1	11.4	10.1	11.6	12.4	12.9	12.8	9.4	4.1

Wild Steelhead

	0800	0900	1000	1100	Noon	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	MID	0100	0200	0300	0400	0500	0600	0700
1985	1.0	0.8	0.8	0.8	0.7	0.9	1.0	0.8	0.7	0.7	0.7	0.7	0.9	3.0	9.6	10.7	10.1	10.9	9.9	10.0	10.1	9.2	4.2	1.6
1986	2.0	1.4	1.3	0.9	0.8	0.8	1.1	0.9	1.0	1.1	1.2	1.5	3.0	6.4	10.8	13.0	9.8	8.1	7.6	6.7	5.6	5.9	5.9	3.1
1987	0.7	0.4	0.5	0.4	0.5	0.4	0.6	0.3	0.6	0.2	0.4	0.3	0.5	2.7	10.9	13.4	11.2	10.7	9.6	10.1	10.7	8.7	5.1	1.5
1988	1.2	2.4	2.9	1.3	1.5	1.3	2.0	1.0	1.2	1.0	0.9	1.5	2.0	4.9	8.1	10.5	8.0	7.8	8.5	8.6	8.0	7.7	5.2	2.5
1989	2.5	1.8	2.1	3.1	2.9	1.8	2.1	1.8	2.0	2.3	2.3	3.1	3.5	7.3	12.8	9.1	6.7	6.5	5.8	6.0	5.6	4.6	2.7	1.9
1990	0.4	0.3	0.7	0.2	0.4	0.2	0.7	0.2	0.5	0.2	0.6	0.2	0.7	7.3	15.7	15.7	11.1	8.1	8.8	7.6	9.2	7.7	2.9	0.4
1991	1.1	0.6	0.7	0.6	1.0	0.5	0.7	0.3	0.6	0.9	0.8	1.4	1.9	6.0	18.0	16.1	11.4	9.1	6.5	7.2	5.8	5.4	2.1	1.1
1992	0.3	0.5	0.3	0.4	0.4	0.5	0.3	0.4	0.3	0.6	0.2	0.1	0.3	2.1	8.1	13.0	13.7	12.4	12.6	11.1	9.9	8.7	3.3	0.6
1993	1.9	1.5	1.1	1.2	1.1	1.1	1.1	1.2	1.4	1.2	1.4	1.5	2.2	6.5	17.2	14.8	8.9	6.9	6.5	5.0	5.0	5.3	3.6	2.3
1994	0.7	0.6	0.5	2.6	0.4	0.4	0.3	0.5	0.5	0.4	0.4	0.5	0.6	2.4	8.1	11.4	10.8	9.3	11.0	10.8	12.0	10.7	3.9	1.1
1995	0.8	1.3	0.5	0.5	0.2	0.4	0.4	0.4	0.6	0.5	0.9	0.7	1.6	2.3	12.7	12.8	10.3	10.3	8.1	8.0	7.5	7.4	6.1	5.5
1996	1.5	1.6	1.1	1.2	1.4	1.2	1.4	1.3	1.4	1.0	2.1	2.0	3.8	4.3	15.3	15.1	9.0	8.9	6.2	5.9	3.9	3.6	3.7	3.1
1997	2.9	3.0	2.3	2.4	2.4	2.2	2.6	2.3	2.6	2.6	3.5	3.2	5.2	6.8	9.8	8.7	5.4	5.3	4.3	4.4	4.7	4.4	4.6	4.3
AVG	1.4	1.3	1.2	1.3	1.1	0.9	1.1	0.9	1.1	1.0	1.3	1.4	2.2	4.7	12.8	12.8	9.4	8.6	7.7	7.4	7.2	6.5	4.2	2.5
MIN	0.3	0.3	0.3	0.2	0.2	0.2	0.3	0.2	0.3	0.2	0.2	0.1	0.3	2.1	8.1	8.7	5.4	5.3	4.3	4.4	3.9	3.6	2.1	0.4
MAX	2.9	3.0	2.9	3.1	2.9	2.2	2.6	2.3	2.6	2.6	3.5	3.2	5.2	7.3	18.0	16.1	13.7	12.4	12.6	11.1	12.0	10.7	6.1	5.5

Hatchery Steelhead

	0800	0900	1000	1100	Noon	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	MID	0100	0200	0300	0400	0500	0600	0700
1985																								
1986																								
1987	1.9	1.1	1.3	0.7	0.9	0.6	1.0	0.7	0.9	0.7	0.9	0.6	0.9	2.3	6.0	9.7	8.4	8.8	9.8	10.2	10.9	10.0	7.9	3.7
1988	2.8	3.0	3.1	2.2	1.8	2.1	2.6	2.0	2.1	1.7	1.5	1.5	2.0	6.0	6.9	7.6	6.5	6.6	5.7	6.6	7.2	6.6	6.9	5.0
1989	3.5	1.9	1.6	1.5	1.3	0.9	1.0	1.0	0.8	0.7	0.8	0.8	0.9	2.5	9.7	9.3	7.6	8.3	8.1	8.3	8.5	7.8	7.6	5.5
1990	0.5	0.2	0.7	0.1	0.4	0.2	0.8	0.1	0.6	0.1	0.7	0.3	0.9	3.2	10.5	12.5	10.1	9.8	9.2	9.4	11.4	11.6	5.9	0.9
1991	0.9	0.7	0.8	0.6	0.5	0.5	0.6	0.4	0.5	0.5	0.7	1.1	1.5	5.2	13.8	15.0	12.0	10.0	8.6	7.5	6.9	6.5	4.3	1.0
1992	0.9	0.8	0.6	0.9	0.9	0.9	0.5	0.4	0.4	1.1	0.6	0.2	0.3	2.2	6.4	12.3	11.6	12.7	12.0	11.5	11.3	7.9	3.1	0.7
1993	3.8	2.4	1.8	1.5	1.5	0.9	0.9	0.8	0.8	0.7	0.7	0.8	1.2	3.3	13.1	16.2	9.4	8.0	6.7	6.3	6.0	5.7	4.1	3.5
1994	2.3	2.1	1.5	2.3	1.1	1.1	1.0	1.3	1.3	1.0	1.0	0.9	1.0	3.7	6.5	7.8	8.5	8.0	8.8	9.9	11.3	9.2	5.8	2.8
1995	3.3	4.2	1.4	1.3	0.6	0.6	0.6	0.7	0.6	0.5	0.6	0.6	0.9	1.1	6.5	6.6	7.8	7.8	8.5	8.4	8.9	8.9	9.8	9.7
1996	2.5	2.5	1.9	1.9	1.5	1.6	1.5	1.6	1.5	1.6	1.5	1.7	3.5	3.4	10.2	10.4	8.7	8.5	6.6	6.5	4.8	4.9	5.7	5.8
1997	2.6	2.5	2.2	2.1	2.1	2.0	1.9	1.8	2.2	2.2	2.5	2.7	4.1	4.5	11.4	10.5	6.6	6.5	5.1	5.2	4.4	4.5	5.1	5.1
AVG	2.5	2.3	1.5	1.4	1.1	1.0	1.1	1.0	1.0	1.0	1.0	1.1	1.8	3.4	9.6	10.8	8.8	8.4	7.8	7.7	7.5	7.1	6.2	4.8
MIN	0.5	0.2	0.6	0.1	0.4	0.2	0.5	0.1	0.4	0.1	0.6	0.2	0.3	1.1	6.0	6.6	6.5	6.5	5.1	5.2	4.4	4.5	3.1	0.7
MAX	3.8	4.2	3.1	2.3	2.1	2.1	2.6	2.0	2.2	2.2	2.5	2.7	4.1	6.4	13.8	16.2	12.0	12.7	12.0	11.5	11.4	11.6	9.8	9.7

Table C-3. Continued.

Coho

	0800	0900	1000	1100	Noon	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	MID	0100	0200	0300	0400	0500	0600	0700
1985	0.7	0.5	1.5	0.3	0.5	0.7	0.5	0.3	1.7	0.8	0.7	0.0	1.3	1.8	5.0	12.4	11.7	13.4	13.4	11.5	10.5	6.7	3.2	0.8
1986	0.2	0.3	0.4	0.1	0.6	0.6	0.6	0.4	0.2	0.1	0.3	0.4	0.7	1.1	9.9	22.2	16.7	12.3	9.1	8.4	7.1	6.1	1.9	0.6
1987	0.6	0.5	0.7	0.2	0.3	0.2	0.3	0.1	0.3	0.1	0.3	0.1	0.3	0.5	7.1	11.0	9.4	10.8	10.6	11.0	12.6	13.6	7.9	1.4
1988	1.5	2.1	1.9	1.1	0.7	1.1	1.8	1.0	1.1	0.7	0.6	0.5	0.8	3.3	7.7	11.3	8.0	8.2	8.2	9.4	10.0	9.5	6.9	2.6
1989	1.0	0.4	0.7	0.4	0.5	0.4	0.7	0.2	0.3	0.3	0.4	0.5	0.6	6.2	15.8	13.4	10.8	9.9	8.3	8.5	8.0	7.0	4.1	1.7
1990	0.3	0.2	0.5	0.2	0.6	0.3	0.8	0.2	0.5	0.2	0.4	0.0	0.3	2.5	10.2	11.6	9.1	7.8	9.1	11.3	15.3	13.3	5.2	0.3
1991	0.2	0.3	0.3	0.3	0.4	0.3	0.4	0.1	0.5	0.3	0.5	0.5	1.2	4.3	25.0	18.0	12.7	8.2	6.9	6.6	6.2	5.0	1.5	0.4
1992	0.3	0.1	0.2	0.5	0.3	0.4	0.2	0.5	0.3	0.6	0.4	0.3	0.2	3.2	12.8	15.6	11.6	10.3	9.9	9.2	11.4	8.4	3.2	0.3
1993	1.0	0.4	0.3	0.3	0.3	0.2	0.1	0.1	0.1	0.1	0.1	0.3	0.5	3.8	24.4	17.1	11.8	9.4	6.8	6.4	5.9	5.6	3.2	2.0
1994	0.9	0.7	0.4	0.6	0.5	0.4	0.4	0.5	0.5	0.5	0.5	0.5	0.5	1.7	10.4	10.4	9.1	8.3	9.6	12.0	12.6	11.9	5.2	1.8
1995	0.6	0.8	0.2	0.2	0.1	0.2	0.2	0.2	0.1	0.1	0.2	0.1	0.4	0.5	19.9	19.8	8.6	8.5	6.4	6.4	7.5	7.5	5.8	5.6
1996	1.3	1.2	1.3	1.3	1.6	1.6	1.6	1.6	1.2	1.1	1.6	1.6	2.9	3.5	14.7	14.6	8.9	8.9	5.4	5.4	4.9	4.7	4.6	4.3
1997	1.7	1.4	2.3	2.1	2.3	2.1	2.5	2.0	2.1	1.9	3.5	3.4	5.2	5.4	13.1	12.3	5.7	5.0	5.5	5.5	4.9	4.8	2.8	2.5
AVG	0.9	0.8	0.8	0.7	0.7	0.7	0.8	0.7	0.6	0.5	0.8	0.7	1.3	2.7	14.7	14.7	9.4	8.8	7.5	7.9	8.4	8.0	5.0	2.9
MIN	0.2	0.1	0.2	0.1	0.1	0.2	0.1	0.1	0.1	0.1	0.1	0.0	0.2	0.5	5.0	10.4	5.7	5.0	5.4	5.4	4.9	4.7	1.5	0.3
MAX	1.7	2.1	2.3	2.1	2.3	2.1	2.5	2.0	2.1	1.9	3.5	3.4	5.2	6.2	25.0	22.2	16.7	13.4	13.4	12.0	15.3	13.6	7.9	5.6

Sockeye

	0800	0900	1000	1100	Noon	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	MID	0100	0200	0300	0400	0500	0600	0700
1985	0.8	0.8	1.0	1.1	1.0	1.5	1.6	1.1	1.1	1.1	1.2	1.1	1.2	5.5	12.2	10.1	10.7	10.4	9.2	8.2	8.9	7.1	2.1	1.0
1986	1.0	1.5	1.4	1.4	1.5	1.6	1.8	1.6	1.5	1.8	2.1	2.6	3.2	7.1	14.1	12.6	9.7	7.3	7.5	5.6	4.8	4.4	3.0	1.0
1987	0.3	0.4	0.6	0.3	0.4	0.2	0.5	0.3	0.4	0.3	0.5	0.2	0.4	1.1	5.2	8.7	12.1	14.5	13.6	12.3	12.1	10.0	4.8	0.8
1988	1.2	1.1	1.3	0.7	0.6	0.6	1.3	1.0	1.3	0.6	0.7	0.4	0.9	2.4	4.9	7.3	6.8	8.8	12.3	13.0	11.9	10.3	8.0	2.5
1989	2.7	1.6	2.1	2.0	1.6	1.5	1.9	1.5	1.6	1.1	1.6	1.5	1.6	5.9	13.0	8.1	5.5	6.7	6.4	8.2	8.6	8.5	4.9	1.8
1990	1.2	0.8	1.8	0.8	1.5	0.6	2.5	0.5	2.0	0.7	1.5	1.2	2.4	8.8	12.2	8.6	9.1	7.9	8.0	7.9	9.2	7.2	2.4	1.0
1991	1.2	0.8	1.1	1.1	1.3	1.6	1.3	0.8	1.8	1.9	2.2	3.1	4.8	11.6	16.8	9.0	7.0	5.9	6.1	5.1	6.4	5.5	2.3	1.3
1992	0.4	0.2	0.2	0.6	0.3	0.3	0.6	0.4	0.4	0.6	0.3	0.5	0.5	2.6	10.9	12.0	11.5	13.6	11.9	11.0	9.7	8.4	2.2	0.6
1993	0.6	0.7	0.7	1.0	1.0	1.2	0.9	1.0	1.5	2.1	2.8	3.2	3.4	13.5	24.3	11.7	5.1	3.7	3.6	4.6	4.8	5.5	3.3	1.2
1994	0.6	0.4	0.4	0.4	0.3	0.4	0.4	0.4	0.4	0.4	0.5	0.7	0.8	1.9	8.0	10.6	14.0	11.9	11.3	9.8	10.7	9.4	5.2	0.9
1995	1.3	1.5	1.0	1.0	1.0	1.1	1.6	1.6	2.2	2.1	3.4	3.4	5.2	5.2	22.5	22.6	3.8	3.7	2.4	2.4	3.0	2.7	2.7	2.7
1996	2.7	3.0	2.3	1.9	2.6	1.9	3.7	3.5	2.8	2.7	4.2	4.2	7.3	7.7	10.5	9.9	4.9	4.3	3.7	3.2	4.0	3.3	2.6	3.2
1997	3.0	2.6	3.3	4.3	4.4	3.8	3.6	2.9	3.5	3.4	3.4	4.2	5.4	6.4	7.9	7.9	4.4	4.0	5.6	3.5	3.2	3.8	3.2	2.2
AVG	1.0	1.1	1.1	1.1	1.1	1.2	1.4	1.2	1.4	1.4	1.9	2.1	2.7	6.1	14.4	12.4	8.1	7.8	7.4	6.9	7.0	6.2	3.5	1.5
MIN	0.3	0.2	0.2	0.3	0.3	0.2	0.4	0.3	0.4	0.3	0.3	0.2	0.4	1.1	4.9	7.3	3.8	3.7	2.4	2.4	3.0	2.7	2.1	0.6
MAX	3.0	3.0	3.3	4.3	4.4	3.8	3.7	3.5	3.5	3.4	4.2	4.2	7.3	13.5	24.3	22.6	14.0	14.5	13.6	13.0	12.1	10.3	8.0	3.2

All Species Combined

	0800	0900	1000	1100	Noon	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	MID	0100	0200	0300	0400	0500	0600	0700
1985	0.8	1.0	1.3	2.5	1.5	1.3	1.5	1.1	1.0	1.2	1.2	1.0	1.2	4.8	11.7	9.1	9.2	9.3	9.7	8.0	8.7	7.7	3.8	1.2
1986	1.7	1.4	1.5	1.5	1.5	2.1	1.8	1.6	1.6	1.7	1.7	1.7	2.3	5.7	9.3	10.3	8.3	7.9	7.4	7.1	7.1	7.0	5.4	2.5
1987	1.5	0.8	0.9	0.7	0.8	1.1	1.2	1.1	1.0	0.9	1.0	1.2	1.4	3.1	6.4	9.2	9.3	9.8	9.4	9.8	10.1	9.8	7.0	2.6
1988	2.0	1.6	1.6	1.1	1.1	1.5	1.7	1.5	1.4	1.4	1.3	1.7	1.9	5.1	7.4	7.5	6.8	7.4	8.1	8.8	9.2	8.9	7.4	3.5
1989	2.0	1.2	1.1	0.9	0.9	0.7	0.8	0.8	0.9	0.8	0.9	1.0	1.0	2.9	5.8	6.7	7.5	8.7	10.5	11.1	11.3	10.8	8.0	3.7
1990	0.8	1.0	1.2	1.1	1.3	2.9	1.9	1.4	1.7	1.0	1.1	0.9	1.2	3.7	8.6	11.7	10.4	9.2	9.0	8.7	8.8	8.0	3.7	0.8
1991	0.8	0.6	0.8	0.9	0.9	2.0	2.7	2.3	1.4	1.2	1.1	1.3	1.5	4.1	12.0	13.3	10.8	8.9	7.8	7.4	7.2	6.6	3.3	1.1
1992	1.0	1.1	1.1	1.6	1.5	2.2	1.8	1.7	1.5	1.5	1.3	1.3	1.6	4.1	6.7	9.6	9.8	9.6	9.7	9.5	9.9	7.9	3.2	1.0
1993	2.1	1.5	1.2	1.0	1.0	0.8	0.8	0.8	0.8	0.9	1.0	1.2	1.4	3.9	12.0	12.2	9.1	8.3	8.1	8.1	8.0	7.6	5.1	3.0
1994	1.4	1.7	1.7	2.6	2.7	2.7	2.8	2.5	1.9	1.5	1.4	1.4	2.3	3.8	7.0	7.9	8.0	7.8	7.4	7.7	8.8	8.0	4.4	2.5
1995	1.6	2.1	1.2	1.1	1.0	1.0	1.3	1.3	1.2	1.2	1.6	1.6	1.9	2.5	11.1	11.3	8.9	8.9	7.5	7.5	7.0	6.9	5.4	4.9
1996	2.0	1.9	2.0	2.0	2.0	2.0	2.4	2.4	2.0	1.9	2.3	2.3	3.6	3.9	10.4	10.9	8.4	8.1	6.0	5.8	4.7	4.6	4.4	4.1
1997	2.3	2.1	2.2	2.2	2.4	2.3	2.8	2.3	2.3	2.2	2.5	2.6	3.7	4.4	10.0	9.7	7.1	6.6	5.8	5.7	5.3	5.1	4.3	4.0
AVG	1.8	1.6	1.5	1.7	1.5	1.8	1.8	1.6	1.5	1.4	1.5	1.6	2.1	4.5	10.3	10.8	9.5	9.4	9.1	8.9	9.0	8.5	5.8	3.1
MIN	0.8	0.6	0.8	0.7	0.8	0.7	0.8	0.8	0.8	0.8	0.9	0.9	1.0	2.5	5.8	6.7	6.8	6.6	5.8	5.7	4.7	4.6	3.2	0.8
MAX	2.3	2.1	2.2	2.6	2.7	2.9	2.8	2.5	2.3	2.2	2.5	2.6	3.7	5.7	12.0	13.3	10.8	9.8	10.5	11.1	11.3	10.8	8.0	4.9

Table C-4. John Day annual descaling and mortality rates 1985-2000, .

	YEARLING CHINOOK					SUBYEARLING CHINOOK				
YEAR	SAMPLE	DESC	%DESC	MORT	%MORT	SAMPLE	DESC	%DESC	MORT	%MORT
1985	62,790	3,846	6.2	809	1.3	228,211	4,567	2.0	5,425	2.4
1986	92,856	4,630	5.0	547	0.6	181,857	4,135	2.3	1,231	0.7
1987	84,312	5,617	6.8	1,505	1.8	95,693	2,290	2.5	2,313	2.4
1988	34,071	2,470	7.5	1,292	3.8	109,435	2,186	2.1	3,050	2.8
1989	34,935	3,749	10.9	694	2.0	129,957	5,922	4.7	3,273	2.5
1990	26,907	2,968	11.3	541	2.0	39,280	2,316	6.2	2,009	5.1
1991	26,879	4,487	16.9	320	1.2	46,785	2,696	5.9	775	1.7
1992	42,231	4,256	10.5	1,823	4.3	59,783	1,216	2.1	3,096	5.2
1993	52,821	5,342	10.6	2,464	4.7	116,804	3,954	3.6	6,413	5.5
1994	34,071	2,219	6.8	1,606	4.7	75,164	2,309	3.3	5,004	6.7
1995	34,308	3,361	10.1	1,032	3.0	48,896	3,325	7.1	2,029	4.2
1996	14,560	2,001	13.9	158	1.1	31,157	1,119	3.7	692	2.2
1997	4,586	859	19.1	84	1.8	20,487	1,133	5.6	322	1.6
1998*	27,732	1,675	6.1	133	0.5	31,178	678	2.2	70	0.2
1999^	160,378	9,952	6.2	882	0.5	232,131	2,094	0.9	282	0.1
2000	124,788	3,001	2.4	289	0.2	197,340	1,102	0.6	186	0.1
TOTAL	733,437	57,432	8.0	13,890	1.9	1,446,818	39,940	2.8	35,984	2.5

	UNCLIPPED STEELHEAD					CLIPPED STEELHEAD				
YEAR	SAMPLE	DESC	%DESC	MORT	%MORT	SAMPLE	DESC	%DESC	MORT	%MORT
1985	36,355	1,292	3.6	320	0.9	All Steelhead in Wild				
1986	37,858	962	2.6	156	0.4					
1987	12,374	447	3.6	41	0.3	11,622	634	5.5	94	0.8
1988	6,810	335	5.0	56	0.8	8,227	1,012	12.7	268	3.3
1989	8,585	348	4.1	53	0.6	11,229	1,225	11.0	84	0.7
1990	6,104	303	5.0	76	1.2	4,867	665	13.9	90	1.8
1991	5,455	287	5.3	10	0.2	11,171	1,593	14.3	30	0.3
1992	5,141	332	6.5	54	1.1	11,970	1,663	14.4	389	3.2
1993	16,042	530	3.4	294	1.8	52,936	6,562	12.6	1,049	2.0
1994	7,604	290	3.9	85	1.1	14,454	1,761	12.7	554	3.8
1995	4,043	166	4.1	26	0.6	18,915	2,236	12.0	325	1.7
1996	3,973	134	3.4	3	0.1	11,171	1,310	11.8	30	0.3
1997	4,011	130	3.3	11	0.3	13,645	1,279	9.4	24	0.2
1998*	8,378	132	1.6	4	0.0	6,214	444	7.2	16	0.3
1999^	33,545	649	1.9	36	0.1	42,003	2,537	6.1	83	0.2
2000	44,416	789	1.8	26	0.1	38,475	2,159	5.6	44	0.1
TOTAL	240,694	7,126	3.0	1,251	0.5	256,899	25,080	9.9	3,080	1.2

	COHO					SOCKEYE				
YEAR	SAMPLE	DESC	%DESC	MORT	%MORT	SAMPLE	DESC	%DESC	MORT	%MORT
1985	598	44	7.4	7	1.2	17,246	1,258	7.4	157	0.9
1986	1,990	62	3.1	4	0.2	17,539	1,688	9.7	151	0.9
1987	13,213	741	5.6	36	0.3	11,923	624	5.3	48	0.4
1988	8,680	363	4.3	153	1.8	6,336	320	5.1	45	0.7
1989	6,934	431	6.2	12	0.2	5,497	672	12.3	41	0.7
1990	6,261	418	6.7	7	0.1	1,769	144	8.3	41	2.3
1991	5,104	437	8.6	3	0.1	3,447	604	17.5	4	0.1
1992	9,804	636	6.6	158	1.6	2,608	183	7.1	39	1.5
1993	13,164	669	5.1	110	0.8	14,885	1,630	11.3	397	2.7
1994	11,385	446	4.0	281	2.5	7,270	719	10.1	155	2.1
1995	5,908	244	4.1	8	0.1	5,625	807	14.6	112	2.0
1996	8,551	579	6.8	13	0.2	1,147	84	7.4	9	0.8
1997	3,409	361	10.6	16	0.5	738	152	21.0	13	1.8
1998*	5,330	297	5.6	9	0.2	4,479	726	16.3	17	0.4
1999^	37,941	1,397	3.7	78	0.2	54,710	4,331	8.0	619	1.1
2000	57,716	819	1.4	59	0.1	17,012	280	1.6	18	0.1
TOTAL	195,988	7,944	4.1	954	0.5	96,030	14,222	15.1	1,866	1.9

* 1998 was the first season where samples were collected at the juvenile bypass facility.

^ Sample size during these years were higher than normal to accommodate The Dalles Spillway Survival Study needs.

Table C-5. John Day condition subsampling data, expressed as a percent of sample, 1985-2000.

Yearling Chinook

YEAR	NO.	INJURY			DISEASE				BIRD	3-19%
	SMPLD	HEAD	OPERC.	BODY	PAR.	COL.	FUN.	BKD	PRED	DESC
1985	981	0.92	N/A	1.94	N/A	N/A	N/A	N/A	N/A	10.19
1986	950	1.37	N/A	2.11	N/A	N/A	N/A	N/A	N/A	20.11
1987	1,957	0.36	N/A	1.07	N/A	N/A	N/A	N/A	N/A	15.94
1988	1,870	0.75	0.48	1.34	0.11	N/A	0.8	N/A	0.37	12.03
1989	1,313	1.68	1.07	3.12	0.53	N/A	0.76	0.38	0.53	13.02
1990	1,143	0.26	1.05	0.7	0.09	N/A	0.96	0.61	0.35	20.65
1991	1,959	0.71	0.26	0.46	0.2	N/A	0.56	0.71	1.58	14.34
1992	1,507	0.6	0.13	0.33	0.07	N/A	1.33	0.86	1.39	10.95
1993	3,995	N/A	0.8	2.95	0.35	0.33	0.38	N/A	1.05	15.52
1994	3,879	N/A	0.18	6.21	0.03	0.75	0.85	N/A	1.47	14.54
1995	2,573	2.18	1.63	2.91	1.52	0.31	1.67	2.64	2.37	21.45
1996	2,596	0.58	0.58	1.5	0.5	0.04	0.15	0.39	1.16	28.58
1997	1,509	0.40	0.40	2.32	1.19	0.00	0.27	0.73	1.59	17.30
1998	2,606	0.27	0.58	0.54	0.12	0.08	0.69	0.88	1.07	11.24
1999	2,753	0.33	0.73	1.60	0.44	0.00	0.80	0.65	1.16	15.73
2000	2,541	0.20	0.24	1.77	0.04	0.04	1.22	0.75	1.42	8.93

Subyearling Chinook

YEAR	NO.	INJURY			DISEASE				BIRD	3-19%
	SMPLD	HEAD	OPERC.	BODY	PAR.	COL.	FUN.	BKD	PRED	DESC
1985	2,707	1.81	N/A	1.55	0.04	N/A	0.92	N/A	N/A	7.35
1986	3,517	0.65	N/A	3.18	N/A	N/A	0.77	N/A	N/A	9.01
1987	4,407	0.34	N/A	3.36	N/A	N/A	N/A	N/A	N/A	11.64
1988	4,710	0.25	0.23	0.98	N/A	N/A	12.85	N/A	0.08	8.79
1989	2,997	0.17	0.2	0.33	0.23	N/A	3.77	0.13	0.3	9.68
1990	2,340	0.26	0.38	0.81	0.26	N/A	4.32	0.68	N/A	14.96
1991	3,106	0.35	0.06	0.58	0.19	N/A	4.15	0.06	0.03	9.01
1992	2,520	0.04	0.08	0.75	0.56	N/A	10.79	0.36	0.36	4.09
1993	5,869	N/A	0.15	3.14	0.34	8.62	2.25	N/A	0.12	10.36
1994	4,579	N/A	0.07	3.78	0.31	8.69	1.53	N/A	0.15	8.08
1995	4,392	0.3	0.3	2.44	0.84	2.87	0.34	0.93	0.43	8.06
1996	3,840	0.44	0.73	2.42	1.98	3.78	0.42	0.08	0.26	11.98
1997	5,380	0.69	0.20	1.58	0.22	0.86	0.09	0.11	0.26	8.10
1998	5,169	0.15	0.25	0.00	0.19	0.06	0.21	0.14	0.19	7.70
1999	8,941	0.09	0.38	1.45	0.06	0.10	0.13	0.00	0.34	4.79
2000	9,823	0.08	0.14	1.07	0.05	0.04	0.07	0.01	0.12	2.78

Unclipped Steelhead

YEAR	NO.	INJURY			DISEASE				BIRD	3-19%
	SMPLD	HEAD	OPERC.	BODY	PAR.	COL.	FUN.	BKD	PRED	DESC
1985	96	2.08	N/A	2.08	N/A	N/A	N/A	N/A	N/A	7.29
1986	230	1.3	N/A	3.48	N/A	N/A	N/A	N/A	N/A	8.26
1987	750	0.13	N/A	0.93	N/A	N/A	N/A	N/A	N/A	11.87
1988	1,080	0.09	N/A	0.28	0.09	N/A	0.46	N/A	0.37	5.93
1989	1,159	0.09	0.26	1.04	0.17	N/A	0.17	N/A	0.69	6.47
1990	476	0.42	0.84	0.21	2.1	N/A	1.47	N/A	1.26	14.71
1991	899	0.44	1	0.67	7.45	N/A	N/A	0.33	1.67	7.56
1992	863	0.12	0.58	1.16	3.01	N/A	0.58	0.23	1.74	6.6
1993	2,265	N/A	0.75	1.41	2.65	0.49	0.26	N/A	1.81	10.95
1994	1,605	N/A	0.19	2.87	2.24	N/A	1.43	N/A	2.55	8.66
1995	1,131	2.48	1.33	1.86	15.21	0.18	2.21	0.18	3.45	11.41
1996	1,126	0.89	1.15	1.78	3.46	0	0.27	0	2.49	18.12
1997	1,035	0.40	0.40	2.32	2.22	0.00	0.58	0.10	2.42	9.76
1998	1,707	0.18	0.12	0.06	2.40	0.06	0.23	0.00	1.82	3.57
1999	2,334	0.26	0.73	2.57	5.01	0.00	1.03	0.09	4.88	9.34
2000	2,304	0.04	0.04	1.61	2.52	0.04	0.43	0.09	2.69	10.11

Clipped Steelhead

YEAR	NO.	INJURY			DISEASE				BIRD	3-19%
	SMPLD	HEAD	OPERC.	BODY	PAR.	COL.	FUN.	BKD	PRED	DESC
1985	ALL STEELHEAD IN UNCLIPPED, UNCLIPPED AND CLIPPED WERE NOT DIFFERENTIATED									
1986										
1987										
1988										
1989										
1990	507	0.99	1.18	3.55	1.18	N/A	1.78	N/A	3.16	24.46
1991	1,063	1.03	1.22	1.51	0.38	N/A	0.47	0.09	4.61	25.68
1992	938	0.32	1.71	3.62	0.32	N/A	2.99	N/A	6.08	14.61
1993	2,371	N/A	3.58	5.65	0.89	0.55	1.98	N/A	6.45	36.95
1994	1,812	N/A	1.88	9.93	0.06	0.06	3.92	N/A	15.07	24.17
1995	2,243	4.55	6.55	4.9	7.13	0.13	4.5	0.13	15.07	30.58
1996	2,185	0.87	2.24	4.3	0.64	0.09	0.96	0	9.61	41.05
1997	2,049	1.17	2.54	2.83	0.54	0.05	0.68	0.00	7.22	18.94
1998	1,510	0.73	2.32	0.46	0.40	0.07	1.19	0.13	7.62	12.78
1999	2,716	0.63	2.36	4.31	0.15	0.04	1.25	0.04	8.43	19.33
2000	1,990	0.40	0.65	3.07	0.70	0.05	0.85	0.00	6.88	18.29

Coho

YEAR	NO.	INJURY			DISEASE				BIRD	3-19%
	SMPLD	HEAD	OPERC.	BODY	PAR.	COL.	FUN.	BKD	PRED	DESC
1985	96	2.08	N/A	2.08	N/A	N/A	N/A	N/A	N/A	7.29
1986	230	1.3	N/A	3.48	N/A	N/A	N/A	N/A	N/A	8.26
1987	750	0.13	N/A	0.93	N/A	N/A	N/A	N/A	N/A	11.87
1988	1,080	0.09	N/A	0.28	0.09	N/A	0.46	N/A	0.37	5.93
1989	1,159	0.09	0.26	1.04	0.17	N/A	0.17	N/A	0.69	6.47
1990	849	N/A	N/A	1.3	N/A	N/A	1.18	N/A	1.06	13.43
1991	844	N/A	0.24	0.36	0.12	N/A	0.12	0.12	0.47	14.34
1992	834	0.36	N/A	0.48	N/A	N/A	0.72	N/A	0.96	9.11
1993	2,166	N/A	0.51	0.88	0.14	0.18	0.05	N/A	1.39	8.36
1994	1,450	N/A	0.07	2.69	0.14	0.14	0.28	N/A	2.69	9.66
1995	1,026	0.39	0.1	0.39	0.29	N/A	0.19	N/A	3.8	10.23
1996	1,738	1.09	0.69	1.38	0.46	0	0.23	0	1.55	21.52
1997	1,070	0.65	0.37	0.93	0.65	0.00	0.65	0.19	2.99	14.95
1998	1,374	0.15	0.51	0.36	0.00	0.07	0.29	0.07	1.82	5.90
1999	2,767	0.18	0.51	1.34	0.43	0.00	0.40	0.18	1.52	11.67
2000	2,399	0.17	0.17	1.21	0.38	0.00	0.29	0.04	1.13	4.96

Sockeye

YEAR	NO.	INJURY			DISEASE				BIRD	3-19%
	SMPLD	HEAD	OPERC.	BODY	PAR.	COL.	FUN.	BKD	PRED	DESC
1985	553	0.18	N/A	0.18	N/A	N/A	N/A	N/A	N/A	9.4
1986	588	1.02	N/A	2.55	N/A	N/A	N/A	N/A	N/A	17.18
1987	740	0.41	N/A	0.81	N/A	N/A	N/A	N/A	N/A	17.3
1988	1,004	0.2	0.4	0.1	N/A	N/A	0.4	N/A	N/A	6.08
1989	1,013	0.59	0.59	0.39	N/A	N/A	0.39	0.2	N/A	10.37
1990	361	N/A	0.28	N/A	N/A	N/A	0.83	N/A	N/A	10.25
1991	549	1.46	0.91	0.18	N/A	N/A	0.18	0.18	0.55	9.47
1992	291	1.03	0.34	0.69	N/A	N/A	N/A	N/A	N/A	12.71
1993	1,765	N/A	1.42	2.1	0.06	N/A	0.45	N/A	0.17	14.84
1994	1,656	N/A	0.48	2.05	N/A	0.06	0.18	N/A	0.54	16
1995	1,103	0.91	1.9	1.18	N/A	N/A	0.27	0.27	1	16.41
1996	399	0	1.25	0.25	0.25	0	0.25	0	0.5	20.3
1997	219	0.40	3.20	2.32	1.19	0.00	0.27	0.73	1.59	17.30
1998	1,268	0.08	1.42	0.16	0.00	0.00	0.16	0.08	0.08	15.54
1999	1,864	0.16	1.88	1.61	0.00	0.00	0.80	0.05	0.75	19.05
2000	1,463	0.75	0.75	0.89	0.07	0.00	0.21	0.07	0.14	6.90

Table C-6. John Day historical PIT tag detections, 1993-2000.

Species	Run	Rearing Type	1993 (3B & 3C)	1994 (3B)	1995 (3B)	1996 (3B & 3C)	1997 (3B)	1998	1999	2000
								Full Bypass		
Chinook	Spring	Hatchery	199	205	267	677	66	8,528	21,928	4,420
		Wild	23	10	101	37	8	1,242	3,804	2,438
		Unknown								28
	Summer	Hatchery	24	16	52	145	57	3,656	2,502	5,782
		Wild	4		20	40	4	832	3,024	1,023
		Unknown				1		1		
	Fall	Hatchery	4	3	52	187	38	12,174	7,046	4,375
		Wild	9	4	13	10	2	282	552	541
		Unknown						3	7,205	3,762
	Unknown	Hatchery	44	19	915	795	9	5,964	17,649	1,472
		Wild	17	4	253	182	1	1,190	3,948	3,331
		Unknown	15	14	28	215	5	3,340	5,748	254
Chinook Total			339	275	1,701	2,289	190	37,212	73,406	27,426
Steelhead	Spring	Hatchery				5				
		Wild							327	
	Summer	Hatchery	195	210	1,068	1,321	663	8,109	55,135	8,070
		Wild	62	26	115	141	61	2,510	4,106	5,390
		Unknown				1		10	18	1
	Unknown	Hatchery						63		
Steelhead Total			257	236	1,183	1,468	724	10,692	59,586	13,461
Coho	Fall	Hatchery				5	9	652	4,433	780
		Wild								12
		Unknown						484	562	1
	Spring	Hatchery					3		1	22
		Unknown								2
	Unknown	Hatchery							1	
Coho Total						5	12	1,136	4,997	817
Sockeye	Spring	Hatchery	17		3					
	Summer	Hatchery				8		186	207	26
		Wild		5	1			16	30	7
	Unknown	Hatchery				12	1	13	37	
		Wild	19		9	2	1	355	442	43
		Unknown						4		47
Sockeye Total			36	5	13	22	2	574	716	123
Unknown	Unknown	Wild						1		
		Unknown								21
Unknown Total								1		21
TOTALS (all species combined) =			**632**	**516**	**2,897**	**3,784**	**928**	**49,615**	**138,705**	**41,848**

Table C-7. John Day external mark recaptures, 1985-2000.

Year	Yearling Chinook	Subyearling Chinook	Unclipped Steelhead[a]	Clipped Steelhead	Coho	Sockeye	Total
Brands							
1985	1,960	80		2,113	3	334	4,490
1986	6,084	1,927		4,324	2	304	12,641
1987	1,890	1,024		1,608	4	107	4,633
1988	2,262	1,797		895	3	80	5,037
1989	2,207	1,585		2,150	1	36	5,979
1990	732	337		599	1	9	1,678
1991	576	773		1,134		85	2,568
1992[b]	1,420	945	66	546			2,977
1993[b]	1,069	1,920	24	1,463		39	4,515
1994	265	830		416			1,511
1995	560	317		183			1,060
1996	255	130		75	2		462
1997				16			16
1998				84			84
1999				55			55
2000				284			284
Elastomer							
1996	628						628
1997	201			135			336
1998	432			417			849
1999[c]	5,280			777			6,057
2000[c]	7,292			176			7,468

a. Unclipped and clipped steelhead were not differentiated before 1992.

b. Samples from gatewells 3B and 3C combined.

c. Large increase due to research collection needs.

Table C-8. John Day chinook fry summary, 1987-2000

Year	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Sample	780	3,800	3,922	30	513	141	1,317	47	507	105	1,305	159	675	1,021
Collection	780	3,800	3,922	30	513	141	1,317	47	1,350	217	2,342	4,229	7,012	6,555

Table C-9. John Day adult salmonid fallbacks, 1985-2000.

Year	Dates	# of Gatewells	Chinook		Steelhead		Coho	Sockeye	Total
			Adults	Jacks	Unclipped[1]	Clipped			
1985	4/27-10/29	1	28	85		50	1	12	176
1986	3/28-10/30	1	78	80		134	3	4	299
1987	4/1-11/30	1	25	4		58		1	88
1988	3/30-10/31	1	7	2		47	2		58
1989	3/28-10/31	1	18	7		80	1	22	128
1990	3/27-10/31	1	14	6		35		3	58
1991	4/7-10/31	1	10			34		6	50
1992	3/25-10/13	2	12			42	1	4	59
1993	4/6-10/29	2	12	2		145	1	8	168
1994	4/5-9/30	1	5	10		52	2	5	74
1995	4/6-9/29	1	11	12	40	71	1	2	137
1996	4/8-9/9	1	15	9	21	63		7	115
1997[2]	4/8-9/8	1							0
See Adult Catch Section for Details									
1998	4/9-10/31	up to 48							642
1999	4/1-10/31	up to 48							9,725
2000	4/4 –9/18	Up to 48							5,105

1. Fallbacks were not consistently differentiated as unclipped or clipped prior to 1995.
2. An adult excluder was installed on the sample collection tank in 1997.

Table C-10. John Day PDS dewatering summaries, 1998-00.

1998

Date	Purpose/details	Adult Salmonids	P. Lamprey	Juvenile salmonids	Shad, cat-fish, other	Total
27-Jul-98	Scheduled inspection, Crest gate evaluation	69	100	30-50	138-258	337-477
23-Sep-98	PDS Adult holding investigation	130-140	50-100	200	22	402
29-Oct-98	End of season dewatering	164				164

1999

2-Apr-99	PDS screen cleaner failure, switch gate repairs	2	20-30	50-60		72-92
9-Jun-99	Scheduled inspection, Crest gate malfunction	30-50				30-50
21-Sep-99	PDS Adult holding investigation	150-250	50-60		112	312-424
27-Oct-99	End of season dewatering	182	41		28	251

2000

18-Sep-00	End of season dewatering	250	12	2	55	319

Table C-11. John Day collection numbers for the most numerous incidental species, 1985 - 2000.

Year	American Shad		Pacific Lamprey		Crappie	Sculpin	Mountain	Sucker	Walleye	S-Mouth	Bluegill[1]	Northern	Peamouth	Chisel-
	Juvenile	Adult	Juvenile	Adult	Species	Species	Whitefish	Species		Bass		Squawfish		mouth
1985[2]	90,904	233	35	15	6,174	675	236	571	161	789	18	89	24	195
1986	49,916	516	890	24	279	201	675	501	308	191	35	250	42	137
1987	18,606	176	229	58	1,016	581	499	372	677	283	22	63	27	86
1988	39,474	312	629	52	293	481	236	178	70	163	16	37	65	27
1989	61,832	451	1,928	7	87	113	269	222	101	74	14	53	108	40
1990[3]	330,177	213	923	4	96	48	253	92	24	60	1,054	17	25	25
1991	168,602	179	9,337	44	99	59	383	162	12	79	159	646	14	16
1992	203,782	175	178	6	38	4,827	444	64	813	119	44	9	32	14
1993	180,088	615	4,348	7	58	256	582	295	133	93	237	56	26	11
1994	111,418	460	3,250	28	28	479	353	234	167	68	8	16	104	25
1995[4]	202,375	772	1,143	36	81	29	294	142	84	115	102	41	200	34
1996	56,245	657	481	10	8	23	303	137	28	38	27	18	28	14
1997	108,961	50	486	3	20	11	79	291	4	16	18	3	6	8
1998[5]	1,281,697	276	149,483	1,012	1,802	2,682	17,725	34,583	628	7,554	4,359	187	310	196
1999	5,234,523	939	167,856	493	281	1,050	8,294	6,761	1,347	1,586	2,320	236	117	2,050
2000	8,274,057	174	141,661	467	266	6,710	4,820	1,122	2,412	1,821	320	5	5	1,452

[1] Bluegill and Pumpkinseeds are not differentiated.
[2] Unit 3B was out of service from April 2-26 for STS installations and testing in 1985.
[3] Sampling was done in Gatewell 5B during the 1990 season, and an electrical fire shut down the unit from 29 May to 10 June.
[4] Starting in 1995, subsampling was implemented and collection estimates were calculated. Prior to 1995, all sampling was at 100%.
[5] Starting in 1998, samples were collected using the “full bypass” system.

Table C-12. John Day Dam smolt monitoring program summary, 1985-2000.

					Yearling Chinook					Subyearling Chinook					Coho				
					~~Collection~~			~~Index~~			~~Collection~~		~~Index~~			~~Collection~~		~~Index~~	
Year	Dates	Sampling Effort	Sub-Sampling	Sample Rate	Sample #	Hourly	Daily	Hourly	Daily	Sample #	Hourly	Daily	Hourly	Daily	Sample #	Hourly	Daily	Hourly	Daily
1985	4/27-10/29	24/day	NO	1	63,578	NA	63,578	NA	-	226,577	NA	226,577	NA	-	600	NA	600	NA	-
1986	3/28-10/30	24/day	NO	1	92,591	NA	92,951	NA	-	182,117	NA	182,117	NA	-	1,994	NA	1,994	NA	-
1987	4/1-11/30	24/day	NO	1	84,455	NA	84,455	NA	1,020,768	95,505	NA	95,505	NA	760,605	13,200	NA	13,200	NA	170,353
1988	3/30-10/31	24/day	NO	1	34,045	NA	34,045	NA	408,675	109,448	NA	109,448	NA	363,101	8,650	NA	8,650	NA	109,325
1989	3/28-10/31	24/day	NO	1	34,930	NA	34,930	NA	502,642	129,870	NA	129,870	NA	1,017,342	6,930	NA	6,930	NA	99,811
1990	3/27-10/31	24/day	NO	1	26,992	NA	26,992	NA	361,968	39,602	NA	39,602	NA	513,669	6,261	NA	6,261	NA	84,342
1991	4/7-10/31	24/day	NO	1	26,878	NA	26,878	NA	374,387	46,785	NA	46,785	NA	568,206	5,106	NA	5,106	NA	72,725
1992(3c)*	3/25-10/13	24/day	NO	1	23,052	NA	23,052	NA	NA	27,407	NA	27,407	NA	NA	5,887	NA	5,887	NA	NA
1992(3b)	3/25-10/13	24/day	NO	1	19,179	NA	19,179	-	237,172	32,376	NA	32,376	-	294,861	3,917	NA	3,917	-	48,898
1993(3c)	4/6-10/29	24/day	NO	1	11,054	11,054	11,054	NA	NA	50,243	50,243	50,243	NA	NA	3,437	3,437	3,437	NA	NA
1993(3b)	4/6-10/29	24/day	NO	1	41,767	41,767	41,767	715,853	720,361	66,561	66,561	66,561	671,625	717,434	9,727	9,727	9,727	170,849	173,193
1994	4/5-9/30	24/day	NO	1	34,071	34,199	34,199	455,553	446,854	75,164	121,272	121,272	1,150,694	1,207,368	11,385	11,413	11,413	159,173	151,135
1995	4/6-9/29	24/day	YES	.25-1	34,308	90,704	90,348	1,344,193	1,329,229	48,896	89,790	90,350	1,237,324	1,240,260	5,908	22,341	22,135	343,606	335,902
1996	4/8-9/9	24/day	YES	.25-1	14,560	38,995	38,975	737,815	738,311	31,157	46,238	46,232	747,428	737,841	8,551	27,021	27,043	511,251	504,863
1997	4/8-9/8	24/day	YES	.25-1	4,586	7,646	7,646	148,993	154,026	20,487	24,290	24,333	422,730	448,328	3,409	6,556	6,615	143,291	147,267
1998	4/9-10/31	24/day	YES	.0067-.25	27,732	NA	758,689	NA	1,147,861	31,178	NA	1,584,083	NA	2,155,479	5,330	NA	370,277	NA	572,762
1999	4/1-10/31	24/day	YES	.0067-.5	160,378	NA	1,597,819	NA	2,193,904	232,131	NA	3,090,201	NA	3,962,632	37,941	NA	388,932	NA	543,318
2000	4/2-9/18	24/day	YES	.0067-1	124,788	NA	579,810	NA	827,046	197,340	NA	1,132,204	NA	1,680,656	57,716	NA	172,742	NA	263,722

	Unclipped Steelhead				Clipped Steelhead					Sockeye					Total				
	~~Collection~~		~~Index~~		~~Collection~~			~~Index~~		~~Collection~~			~~Index~~		~~Collection~~			~~Index~~	
Sample #	Hourly	Daily	Hourly	Daily	Sample #	Hourly	Daily	Hourly	Daily	Sample #	Hourly	Daily	Hourly	Daily	Sample #	Hourly	Daily	Hourly	Daily
**	NA	**	NA	NA	36,616	NA	36,616	NA	-	17,235	NA	17,235	NA	-	344,606	NA	344,606	NA	-
**	NA	**	NA	NA	37,822	NA	37,822	NA	-	17,505	NA	17,505	NA	-	332,029	NA	332,389	NA	-
**	NA	**	NA	NA	23,988	NA	23,988	NA	300,410	11,911	NA	11,911	NA	145,232	229,059	NA	229,059	NA	2,397,368
**	NA	**	NA	NA	14,985	NA	14,985	NA	179,089	6,333	NA	6,333	NA	80,406	173,461	NA	173,461	NA	1,140,596
**	NA	**	NA	NA	19,818	NA	19,818	NA	281,685	5,496	NA	5,496	NA	78,190	197,044	NA	197,044	NA	1,979,670
5,028	NA	5,028	NA	68,428	4,921	NA	4,921	NA	6,349	1,755	NA	1,755	NA	23,592	84,559	NA	84,559	NA	1,058,348
5,456	NA	5,456	NA	75,687	11,166	NA	11,166	NA	158,305	3,450	NA	3,450	NA	52,203	98,841	NA	98,841	NA	1,301,513
2,770	NA	2,770	NA	NA	6,917	NA	6,917	NA	NA	1,647	NA	1,647	NA	NA	67,680	NA	67,680	NA	NA
2,371	NA	2,371	-	28,712	5,053	NA	5,053	-	63,494	961	NA	961	-	12,051	63,857	NA	63,857	NA	685,188
4,668	4,668	4,668	NA	NA	7,416	7,416	7,416	NA	NA	813	813	813	NA	NA	77,631	77,631	77,631	NA	NA
11,374	11,374	11,374	186,696	189,400	45,520	45,520	45,520	879,844	882,474	14,072	14,072	14,072	267,763	272,869	189,021	189,021	189,021	2,892,630	2,955,731
7,604	7,604	7,604	99,845	96,800	14,454	14,457	14,457	196,281	189,420	7,260	7,270	7,270	101,105	96,621	149,938	196,215	196,215	2,162,651	2,188,198
4,043	11,799	11,584	176,102	170,993	18,915	61,865	61,385	930,405	919,021	5,625	18,982	19,526	287,626	293,065	117,695	295,481	295,328	4,319,256	4,288,470
3,973	11,875	11,903	229,600	228,911	11,171	36,202	36,174	705,551	701,899	1,147	3,367	3,373	64,122	64,584	70,559	163,698	163,700	2,995,767	2,976,409
4,011	7,328	7,337	145,192	151,061	13,645	28,504	28,547	598,959	614,087	738	1,171	1,184	25,441	26,519	46,876	75,495	75,662	1,484,606	1,541,288
8,378	NA	296,969	NA	455,339	6,214	NA	408,195	NA	634,446	4,479	NA	338,099	NA	523,866	83,311	NA	3,756,312	NA	5,489,754
33,545	NA	299,072	NA	418,515	42,003	NA	586,952	NA	820,431	54,710	NA	407,398	NA	574,062	560,708	NA	6,370,374	NA	8,512,862
44,416	NA	188,601	NA	271,975	38,475	NA	182,036	NA	250,020	17,012	NA	41,126	NA	59,940	479,747	NA	2,296,519	NA	3,353,359

*3C airlift inoperational 5/13-6/18

**Unclipped and clipped steelhead were not differentiated prior to 1990.

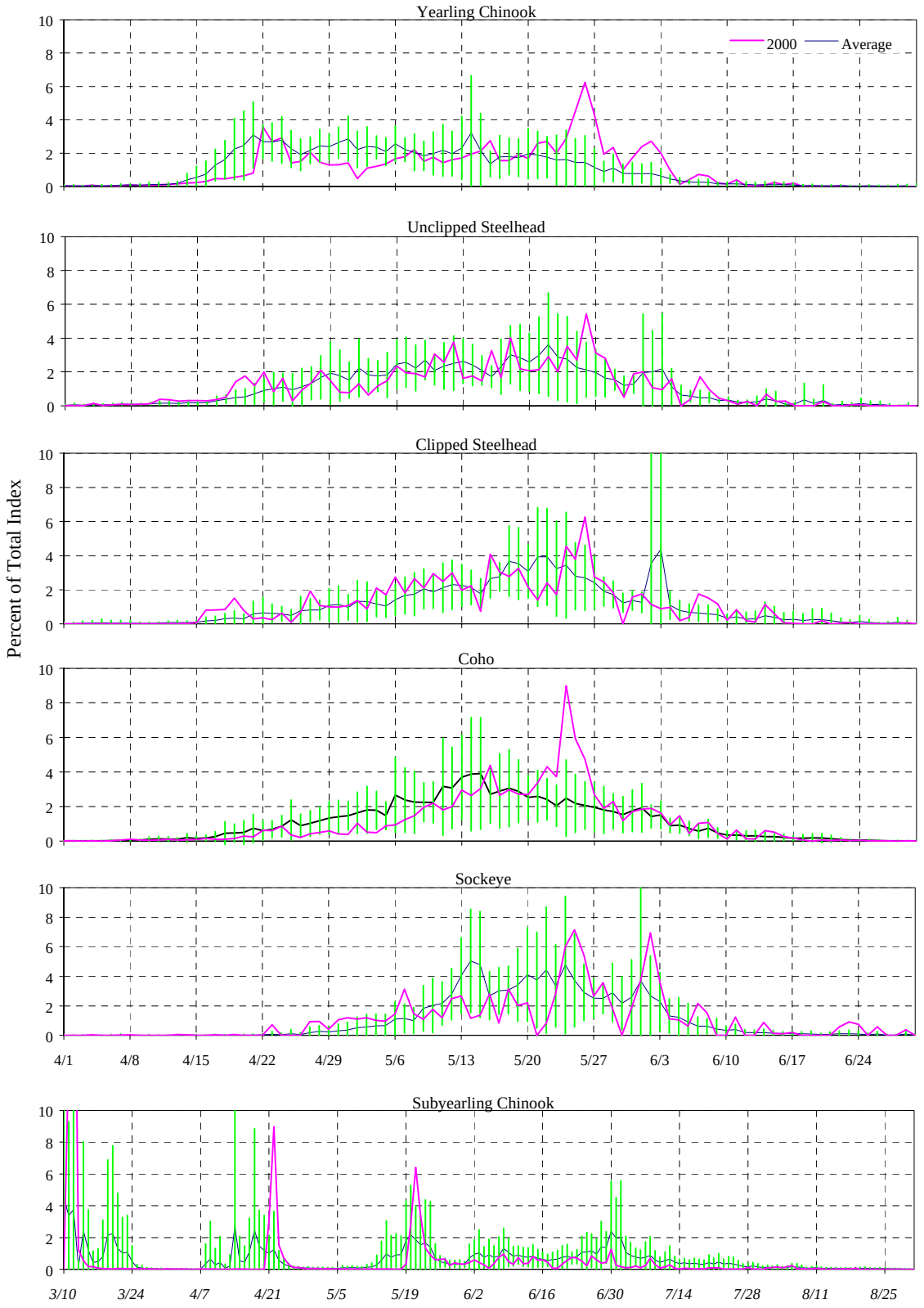

Figure D-1. PH1 average daily passage with standard deviation 1985-2000, and the 2000 daily passage from PH2.

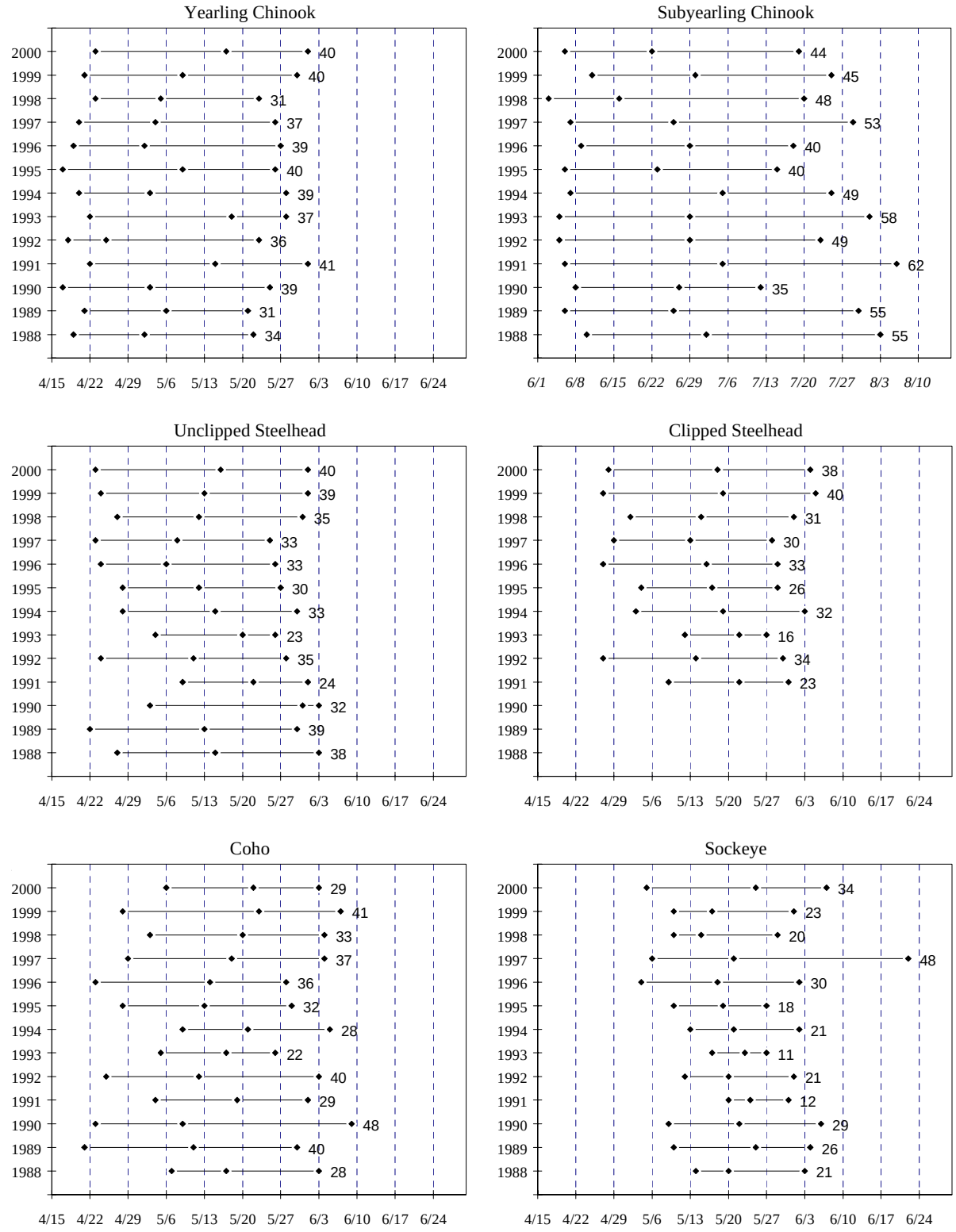

Figure D-2. PH1 10%, 50%, and 90% passage dates by species, 1988-1999, and PH2 for 2000. The duration between 10-90% dates (in days) is indicated for each year. Clipped and unclipped steelhead were not differentiated before 1991.

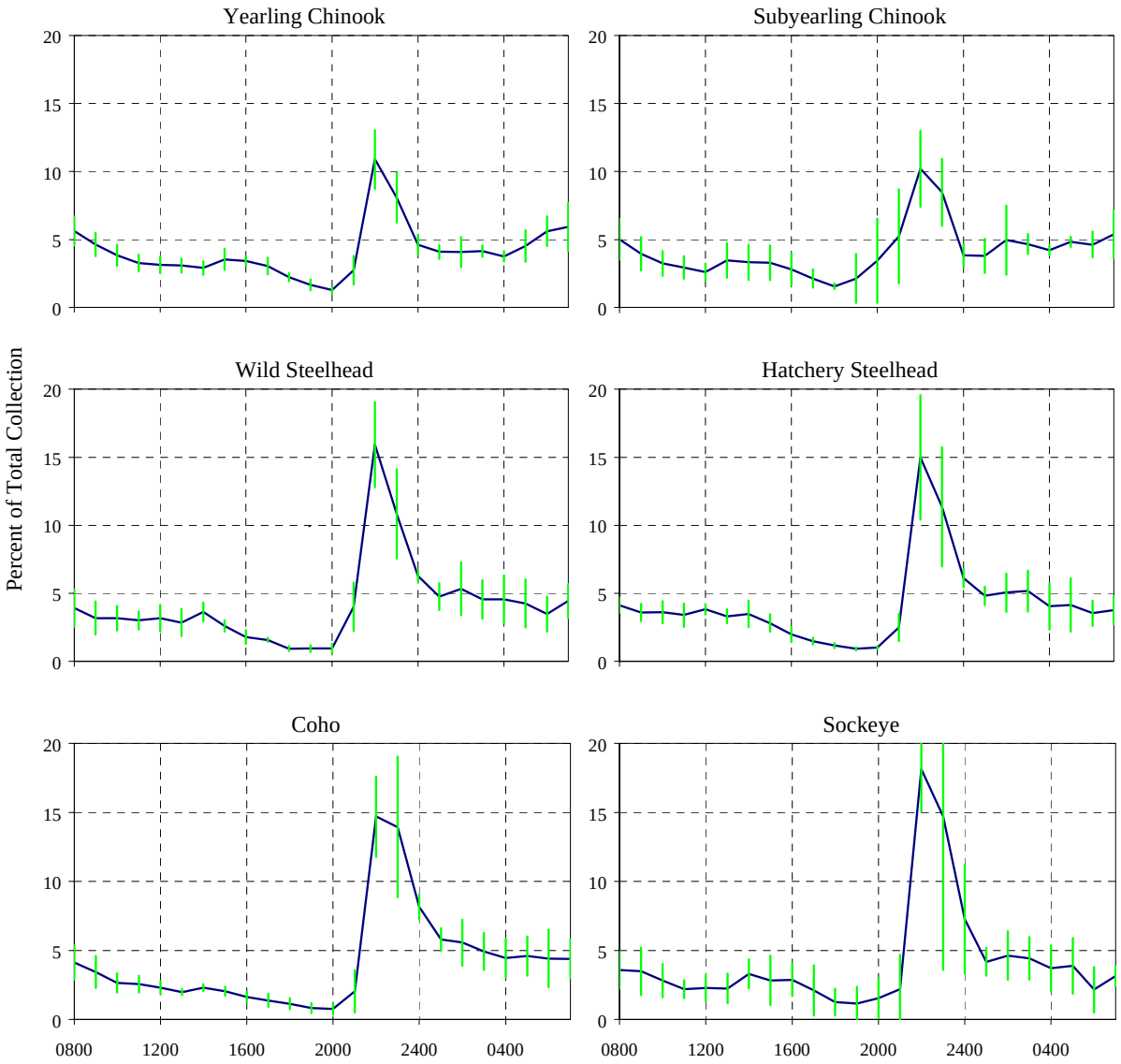

Figure D-3. PH1 average diel passage with standard deviation 1992-1995.

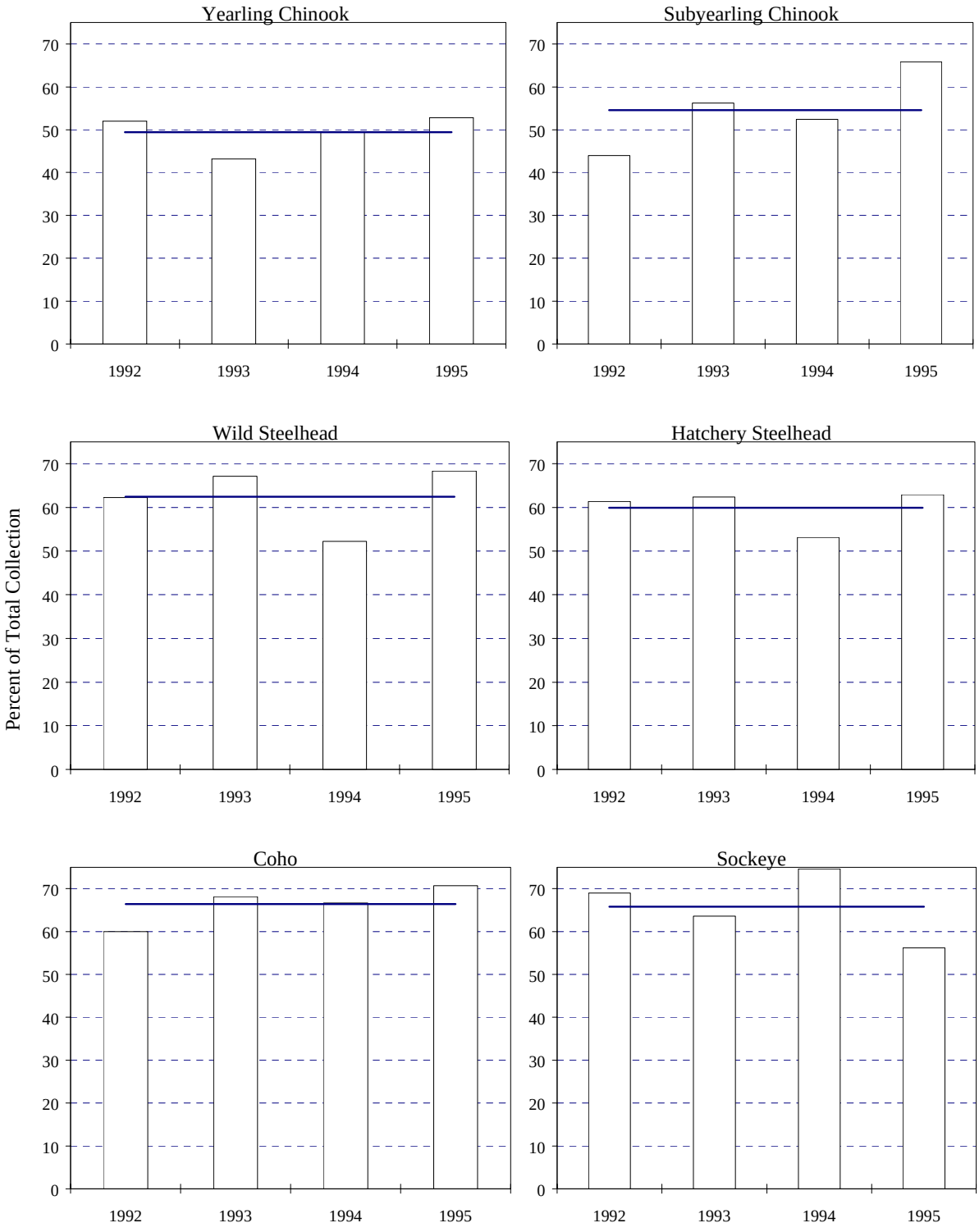

Figure D-4. PH1 percent night passage (2000-0500) by species, 1992-1995, average indicated by horizontal line.

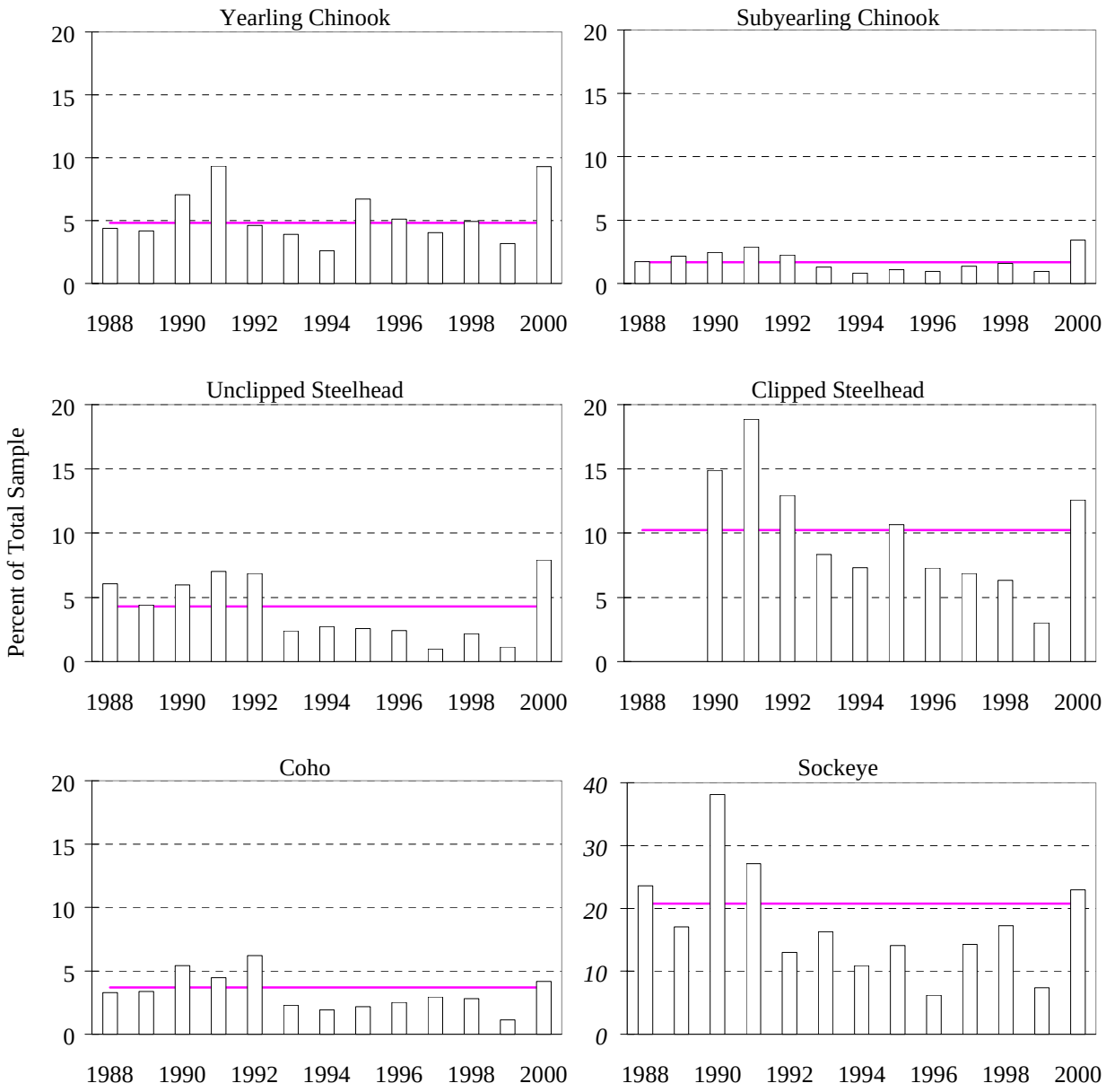

Figure D-5. PH1 annual descaling rate, 1988-2000, horizontal line is the average. Clipped and unclipped steelhead were not differentiated before 1990.

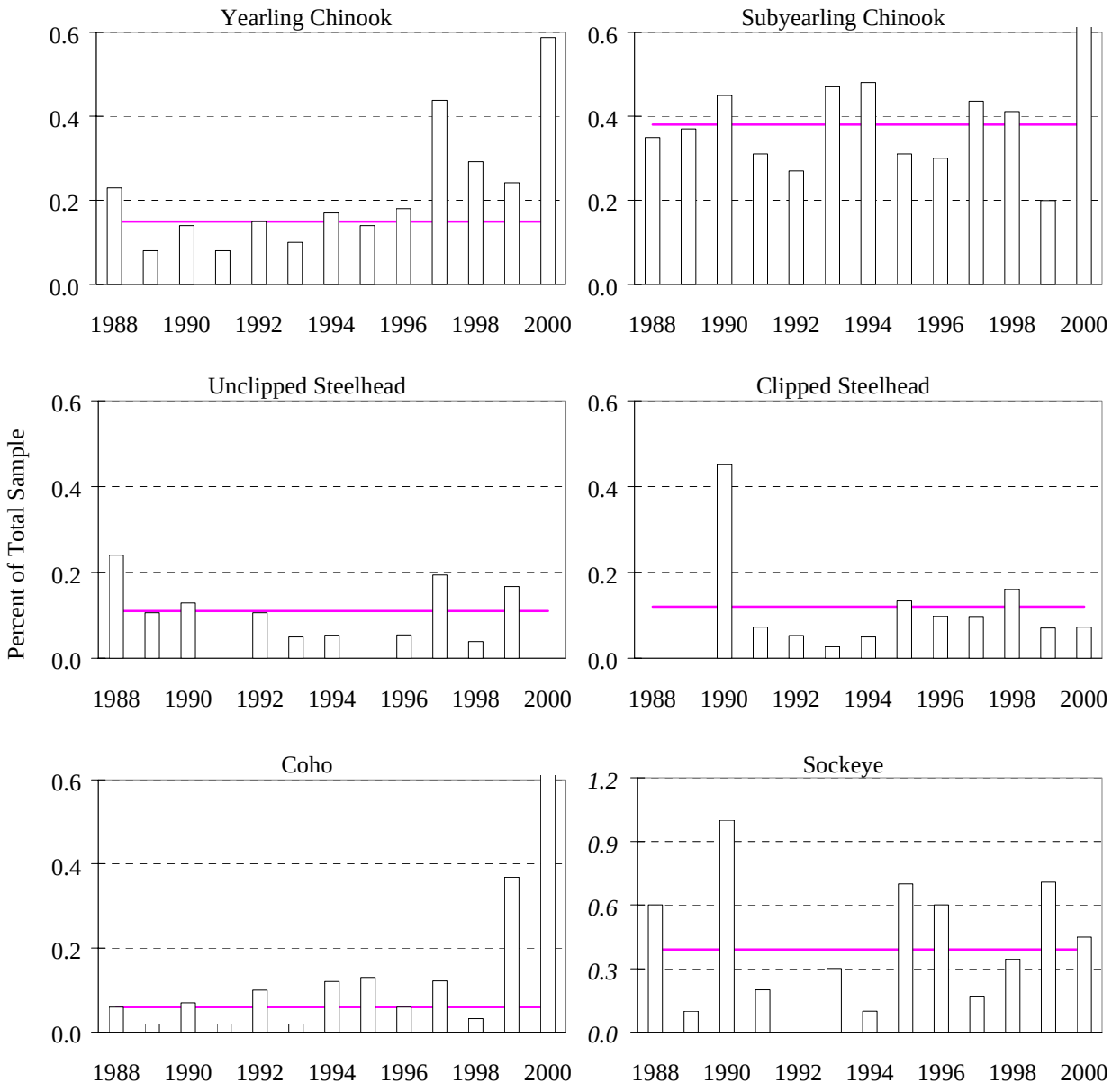

Figure D-6. PH1 annual mortality rate, horizontal line is the average, 1988-2000. Clipped and unclipped steelhead were not differentiated before 1990.

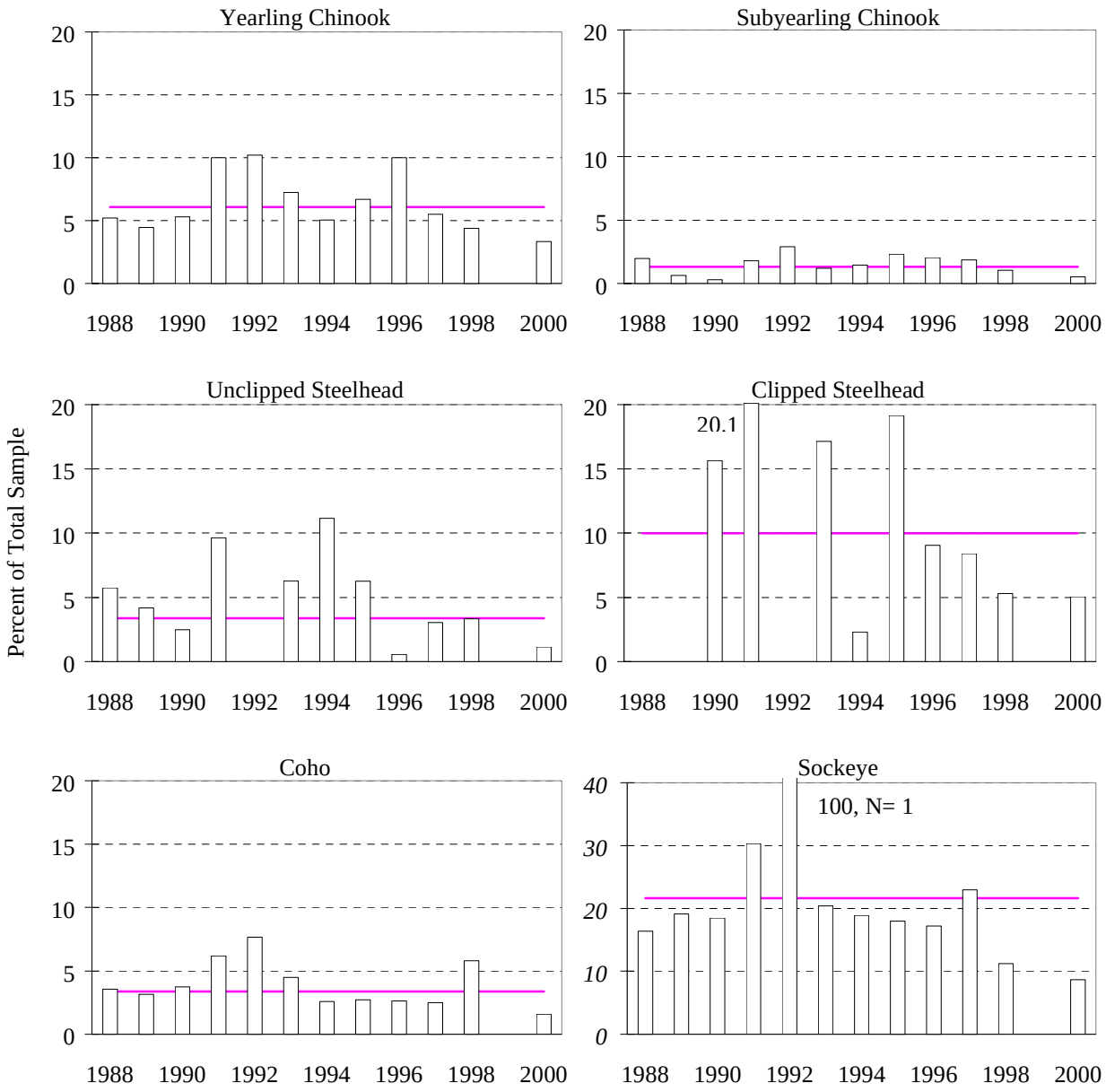

Figure D-7. PH2 annual descaling rate, horizontal line is the average, 1988-2000. Clipped and unclipped steelhead were not differentiated before 1990. No sampling conducted in 1999 at PH2.

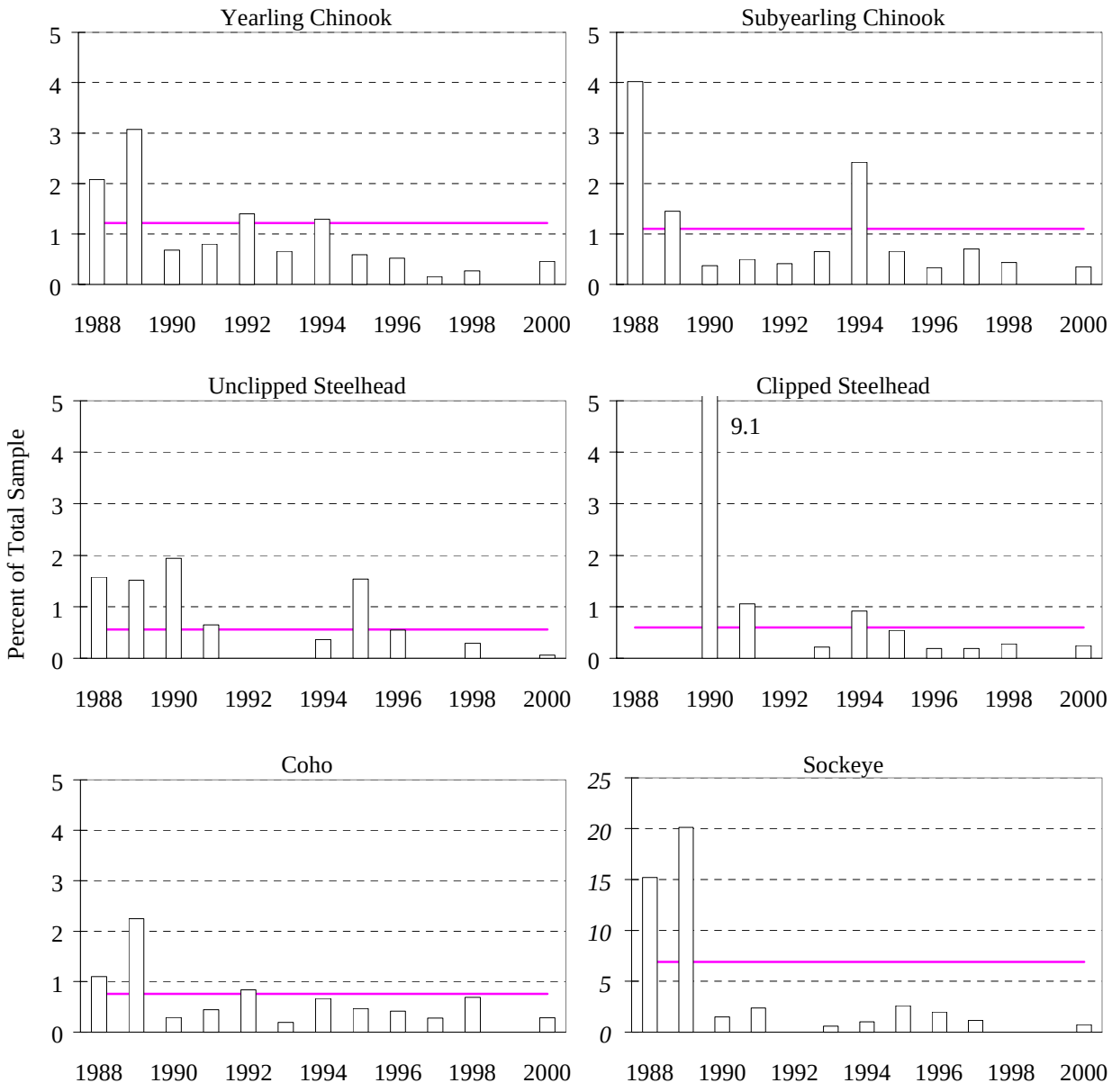

Figure D-8. PH2 annual mortality rate, horizontal line is the average, 1988-2000. Clipped and unclipped steelhead were not differentiated before 1990. No sampling conducted in 1999 at PH2.

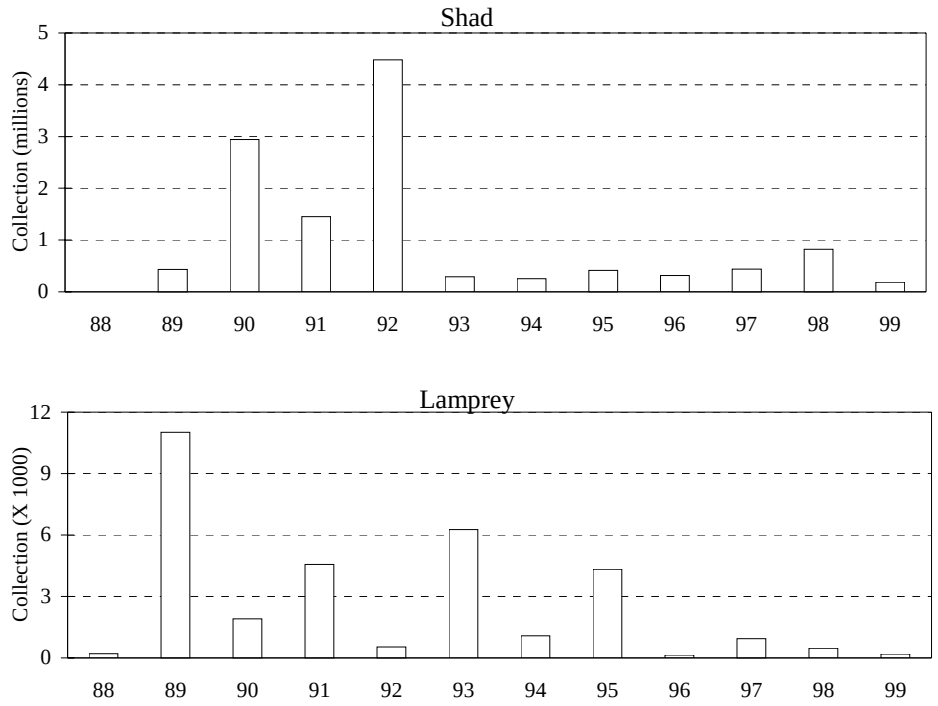

Figure D-9. PH1 annual shad and lamprey totals, 1988-1999.

Table D-1. PH1 percent night passage (1800-0600) for 1992-95.

YEAR	Yearling Chinook	Subyearling Chinook	Wild Steelhead	Hatchery Steelhead	Coho	Sockeye
1992	52.0	44.0	62.3	61.3	60.0	69.0
1993	43.2	56.2	67.1	62.4	68.1	63.6
1994	49.6	52.4	52.2	53.1	66.7	74.6
1995	52.8	65.8	68.3	62.9	70.7	56.2
MEDIAN	50.8	54.3	64.7	61.9	67.4	66.3
MIN	43.2	44.0	52.2	53.1	60.0	56.2
MAX	52.8	65.8	68.3	62.9	70.7	74.6

Table D-2. PH1 10%, 50%, and 90% passage dates, 1988-1999 and PH2 for 2000.

Yearling Chinook				
	10 %	50%	90 %	# of Days
1988	19-Apr	02-May	22-May	34
1989	21-Apr	06-May	21-May	31
1990	17-Apr	03-May	25-May	39
1991	22-Apr	15-May	01-Jun	41
1992	18-Apr	25-Apr	23-May	36
1993	22-Apr	18-May	28-May	37
1994	20-Apr	03-May	28-May	39
1995	17-Apr	09-May	26-May	40
1996	19-Apr	02-May	27-May	39
1997	20-Apr	4-May	26-May	37
1998	23-Apr	5-May	23-May	31
1999	21-Apr	9-May	30-May	40
2000	23-Apr	17-May	1-Jun	40
MEDIAN	20-Apr	05-May	26-May	37
MIN	17-Apr	25-Apr	21-May	31
MAX	23-Apr	18-May	01-Jun	41

Subyearling Chinook - "Brights" Only				
	10 %	50%	90 %	# of Days
1988	10-Jun	02-Jul	03-Aug	55
1989	06-Jun	26-Jun	30-Jul	55
1990	08-Jun	27-Jun	12-Jul	35
1991	06-Jun	05-Jul	06-Aug	62
1992	05-Jun	29-Jun	23-Jul	49
1993	05-Jun	29-Jun	01-Aug	58
1994	07-Jun	05-Jul	25-Jul	49
1995	6-Jun	23-Jun	15-Jul	40
1996	9-Jun	29-Jun	18-Jul	40
1997	7-Jun	26-Jun	29-Jul	53
1998	3-Jun	16-Jun	20-Jul	48
1999	11-Jun	30-Jun	25-Jul	45
2000	6-Jun	22-Jun	19-Jul	44
MEDIAN	06-Jun	29-Jun	25-Jul	50
MIN	03-Jun	16-Jun	12-Jul	35
MAX	11-Jun	05-Jul	06-Aug	62

Unclipped Steelhead				
	10 %	50%	90 %	# of Days
1988*	27-Apr	15-May	03-Jun	38
1989*	22-Apr	13-May	30-May	39
1990*	03-May	31-May	03-Jun	32
1991	09-May	22-May	01-Jun	24
1992	24-Apr	11-May	28-May	35
1993	04-May	20-May	26-May	23
1994	28-Apr	15-May	30-May	33
1995	28-Apr	12-May	27-May	30
1996	24-Apr	6-May	26-May	33
1997	23-Apr	8-May	25-May	33
1998	27-Apr	12-May	31-May	35
1999	24-Apr	13-May	1-Jun	39
2000	23-Apr	16-May	1-Jun	40
MEDIAN	27-Apr	13-May	30-May	34
MIN	22-Apr	06-May	25-May	23
MAX	09-May	31-May	03-Jun	40

Clipped Steelhead				
	10 %	50%	90 %	# of Days
1988*				
1989*				
1990*				
1991	09-May	22-May	31-May	23
1992	27-Apr	14-May	30-May	34
1993	12-May	22-May	27-May	16
1994	03-May	19-May	03-Jun	32
1995	04-May	17-May	29-May	26
1996	27-Apr	16-May	29-May	33
1997	29-Apr	13-May	28-May	30
1998	2-May	15-May	1-Jun	31
1999	27-Apr	19-May	5-Jun	40
2000	28-Apr	18-May	4-Jun	38
MEDIAN	30-Apr	17-May	30-May	31
MIN	27-Apr	13-May	27-May	16
MAX	12-May	22-May	05-Jun	40

Coho				
	10 %	50%	90 %	# of Days
1988	07-May	17-May	03-Jun	28
1989	21-Apr	11-May	30-May	40
1990	23-Apr	09-May	09-Jun	48
1991	04-May	19-May	01-Jun	29
1992	25-Apr	12-May	03-Jun	40
1993	05-May	17-May	26-May	22
1994	09-May	21-May	05-Jun	28
1995	28-Apr	13-May	29-May	32
1996	23-Apr	14-May	28-May	36
1997	29-Apr	18-May	4-Jun	37
1998	3-May	20-May	4-Jun	33
1999	28-Apr	23-May	7-Jun	41
2000	6-May	22-May	3-Jun	29
MEDIAN	29-Apr	17-May	03-Jun	36
MIN	21-Apr	09-May	26-May	22
MAX	09-May	23-May	09-Jun	48

Sockeye (Wild + Hatchery)				
	10 %	50%	90 %	# of Days
1988	14-May	20-May	3-Jun	21
1989	10-May	25-May	4-Jun	26
1990	9-May	22-May	6-Jun	29
1991	20-May	24-May	31-May	12
1992	12-May	20-May	1-Jun	21
1993	17-May	23-May	27-May	11
1994	13-May	21-May	2-Jun	21
1995	10-May	19-May	27-May	18
1996	4-May	18-May	2-Jun	30
1997	6-May	21-May	22-Jun	48
1998	10-May	15-May	29-May	20
1999	10-May	17-May	1-Jun	23
2000	5-May	25-May	7-Jun	34
MEDIAN	10-May	21-May	02-Jun	24
MIN	04-May	15-May	27-May	11
MAX	20-May	25-May	22-Jun	48

* Years in which no differentiation was made between wild and hatchery steelhead for index purposes.
Data for 2000 are based on index numbers from the PH2 juvenile bypass system.

Table D-3. PH1 percent of total passage per hour, 1992-1995.

Yearling Chinook

	0800	0900	1000	1100	Noon	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	MID	0100	0200	0300	0400	0500	0600	0700
1992	5.1	5.4	4.1	3.6	3.2	2.9	2.6	2.8	3.1	2.5	1.9	1.4	1.5	3.9	11.8	10.5	4.9	4.2	3.8	4.3	3.6	3.6	5.2	3.8
1993	6.7	5.0	4.8	4.0	4.0	3.4	2.9	4.3	3.8	3.9	2.6	2.2	1.4	1.5	7.9	6.8	3.5	3.5	3.1	3.5	3.4	3.8	6.2	7.7
1994	6.2	4.5	3.2	2.7	2.5	2.4	2.4	2.9	3.2	2.7	2.2	1.6	1.0	2.4	11.0	8.5	4.9	4.1	3.7	4.3	3.8	6.2	6.8	6.9
1995	4.4	3.4	3.1	2.8	2.9	3.6	3.6	4.0	3.4	3.0	2.1	1.4	1.1	3.2	12.9	6.6	5.2	4.7	5.7	4.5	4.3	4.6	4.3	5.1
AVG	5.8	4.5	3.8	3.2	3.1	3.0	2.9	3.6	3.4	3.1	2.3	1.7	1.2	2.5	10.5	7.8	4.5	4.1	4.0	4.1	3.8	4.7	5.8	6.4
MIN	4.4	3.4	3.1	2.7	2.5	2.4	2.4	2.8	3.1	2.5	1.9	1.4	1.0	1.5	7.9	6.6	3.5	3.5	3.1	3.5	3.4	3.6	4.3	3.8
MAX	6.7	5.4	4.8	4.0	4.0	3.6	3.6	4.3	3.8	3.9	2.6	2.2	1.5	3.9	12.9	10.5	5.2	4.7	5.7	4.5	4.3	6.2	6.8	7.7

Subyearling Chinook

	0800	0900	1000	1100	Noon	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	MID	0100	0200	0300	0400	0500	0600	0700
1992	6.5	4.6	4.1	4.0	3.3	5.1	4.4	4.2	4.1	3.0	1.8	1.0	0.6	4.3	9.4	7.9	3.1	2.6	3.1	4.5	4.0	4.5	4.0	5.8
1993	4.5	3.2	2.8	2.3	2.1	2.0	1.9	2.1	1.8	1.6	1.6	4.8	7.7	10.2	7.4	6.1	4.5	5.0	3.8	3.9	4.1	5.0	6.0	5.5
1994	5.8	5.1	3.8	3.2	2.9	3.2	4.2	4.5	3.6	2.2	1.6	0.9	2.0	4.0	9.9	7.7	3.2	2.9	4.3	4.5	4.1	4.7	4.4	7.1
1995	3.2	2.7	2.2	2.4	2.1	3.5	2.6	2.2	1.8	1.7	1.3	1.8	3.5	2.4	14.0	11.9	4.6	4.7	8.7	5.7	4.7	5.2	4.1	3.0
AVG	5.2	4.3	3.4	3.0	2.7	3.3	3.5	3.6	3.0	2.1	1.6	1.8	3.1	5.0	10.1	8.1	3.6	3.5	4.7	4.6	4.2	4.8	4.6	6.0
MIN	3.2	2.7	2.2	2.3	2.1	2.0	1.9	2.1	1.8	1.6	1.3	0.9	0.6	2.4	7.4	6.1	3.1	2.6	3.1	3.9	4.0	4.5	4.0	3.0
MAX	6.5	5.1	4.1	4.0	3.3	5.1	4.4	4.5	4.1	3.0	1.8	4.8	7.7	10.2	14.0	11.9	4.6	5.0	8.7	5.7	4.7	5.2	6.0	7.1

Wild Steelhead

	0800	0900	1000	1100	Noon	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	MID	0100	0200	0300	0400	0500	0600	0700
1992	3.8	3.7	3.2	3.7	3.9	2.6	3.4	2.2	1.1	1.6	0.7	0.7	0.7	4.1	16.9	15.3	6.3	4.1	4.3	4.4	3.2	2.8	3.0	4.2
1993	4.0	2.3	2.4	2.8	2.8	1.9	2.7	2.4	1.8	1.8	1.2	1.0	0.8	2.8	11.9	8.1	6.3	6.2	6.9	6.4	6.7	6.5	5.4	4.9
1994	5.5	4.7	4.4	3.6	4.1	4.4	4.4	3.3	2.4	1.6	1.0	0.8	0.7	2.6	15.5	11.1	5.5	4.1	3.0	2.8	3.0	2.8	3.0	5.5
1995	2.2	2.0	2.6	2.1	2.0	2.7	4.1	2.7	1.9	1.5	0.8	1.3	1.4	6.5	19.4	8.7	6.8	4.3	7.0	4.5	5.3	4.8	2.4	2.8
AVG	4.4	3.4	3.3	3.1	3.3	3.1	3.7	2.8	2.0	1.7	1.0	0.9	0.9	3.3	14.8	10.0	6.0	4.9	5.1	4.5	4.7	4.5	3.8	4.8
MIN	2.2	2.0	2.4	2.1	2.0	1.9	2.7	2.2	1.1	1.5	0.7	0.7	0.7	2.6	11.9	8.1	5.5	4.1	3.0	2.8	3.0	2.8	2.4	2.8
MAX	5.5	4.7	4.4	3.7	4.1	4.4	4.4	3.3	2.4	1.8	1.2	1.3	1.4	6.5	19.4	15.3	6.8	6.2	7.0	6.4	6.7	6.5	5.4	5.5

Hatchery Steelhead

	0800	0900	1000	1100	Noon	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	MID	0100	0200	0300	0400	0500	0600	0700
1992	3.8	3.3	3.2	3.5	4.0	3.3	3.1	2.5	1.3	1.3	1.3	1.1	0.9	3.2	16.5	16.1	6.9	4.3	3.6	3.9	2.7	3.0	3.4	3.6
1993	4.6	3.8	3.3	3.0	4.0	2.6	2.3	2.6	1.9	1.8	1.1	0.9	1.0	1.8	11.0	6.5	5.5	5.7	6.6	7.1	6.4	7.1	4.6	4.6
1994	4.4	4.4	4.7	4.4	3.2	3.5	4.3	3.7	2.6	1.3	1.0	0.9	0.9	1.5	12.1	14.0	6.5	4.4	4.2	4.1	2.8	3.3	3.7	4.3
1995	3.5	2.8	3.1	2.5	4.0	3.9	3.9	2.3	2.0	1.5	1.3	0.8	1.2	3.4	20.8	8.9	5.7	4.8	5.8	5.6	4.1	3.3	2.4	2.4
AVG	4.2	3.7	3.6	3.3	3.8	3.2	3.2	2.8	2.1	1.6	1.1	0.9	1.0	2.2	14.0	9.4	5.8	5.1	5.7	5.9	4.8	5.0	3.8	3.9
MIN	3.5	2.8	3.1	2.5	3.2	2.6	2.3	2.3	1.3	1.3	1.0	0.8	0.9	1.5	11.0	6.5	5.5	4.3	3.6	3.9	2.7	3.0	2.4	2.4
MAX	4.6	4.4	4.7	4.4	4.0	3.9	4.3	3.7	2.6	1.8	1.3	1.1	1.2	3.4	20.8	16.1	6.9	5.7	6.6	7.1	6.4	7.1	4.6	4.6

Coho

	0800	0900	1000	1100	Noon	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	MID	0100	0200	0300	0400	0500	0600	0700
1992	5.5	4.9	3.6	3.4	2.9	2.1	2.2	1.7	1.4	1.4	0.9	0.5	0.4	1.4	14.1	18.5	9.2	4.8	3.5	3.2	2.7	2.7	4.4	4.6
1993	3.5	3.0	2.3	2.1	2.5	1.7	2.2	2.4	2.0	2.0	1.7	1.2	1.1	2.6	11.1	8.1	7.2	6.7	6.4	6.4	6.1	6.1	7.4	4.2
1994	4.6	3.7	2.6	2.1	1.9	2.0	2.1	1.9	1.2	0.8	0.9	0.5	0.4	0.3	15.3	18.1	8.5	5.6	5.1	4.6	4.4	4.7	3.0	5.8
1995	2.7	2.1	2.1	2.5	1.9	2.2	2.6	2.2	1.8	1.4	1.0	1.1	1.1	3.9	18.1	11.2	7.7	6.1	7.4	5.5	4.8	4.8	2.9	2.7
AVG	3.9	3.3	2.5	2.3	2.2	2.0	2.3	2.1	1.6	1.3	1.1	0.8	0.8	1.8	14.5	13.8	8.0	6.0	5.8	5.2	4.8	5.0	4.4	4.6
MIN	2.7	2.1	2.1	2.1	1.9	1.7	2.1	1.7	1.2	0.8	0.9	0.5	0.4	0.3	11.1	8.1	7.2	4.8	3.5	3.2	2.7	2.7	2.9	2.7
MAX	5.5	4.9	3.6	3.4	2.9	2.2	2.6	2.4	2.0	2.0	1.7	1.2	1.1	3.9	18.1	18.5	9.2	6.7	7.4	6.4	6.1	6.1	7.4	5.8

Sockeye

	0800	0900	1000	1100	Noon	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	MID	0100	0200	0300	0400	0500	0600	0700
1992	3.8	5.8	4.5	1.7	2.0	1.8	2.9	1.6	2.6	0.4	0.4	0.1	0.7	0.4	21.0	22.4	11.5	3.7	2.9	2.9	1.8	1.9	0.4	2.9
1993	5.0	2.8	2.9	2.7	2.0	1.8	2.7	2.7	2.2	2.2	1.7	1.6	1.9	2.9	17.0	5.1	4.7	5.4	7.0	6.1	5.5	5.7	4.3	3.9
1994	3.4	3.6	1.9	1.6	1.3	1.3	2.5	1.6	2.1	1.1	0.5	0.3	0.1	0.1	20.2	26.1	9.8	4.5	4.1	3.4	3.0	2.4	1.6	3.6
1995	1.7	1.6	2.1	2.8	3.5	3.9	4.9	5.4	4.7	4.6	2.5	2.7	3.4	5.4	14.4	5.2	3.3	3.1	4.8	5.3	4.7	5.6	2.3	2.2
AVG	3.9	2.8	2.5	2.5	2.1	2.1	3.1	2.9	2.7	2.4	1.6	1.5	1.7	2.7	17.3	10.6	5.8	4.7	5.8	5.2	4.7	4.8	3.2	3.5
MIN	1.7	1.6	1.9	1.6	1.3	1.3	2.5	1.6	2.1	0.4	0.4	0.1	0.1	0.1	14.4	5.1	3.3	3.1	2.9	2.9	1.8	1.9	0.4	2.2
MAX	5.0	5.8	4.5	2.8	3.5	3.9	4.9	5.4	4.7	4.6	2.5	2.7	3.4	5.4	21.0	26.1	11.5	5.4	7.0	6.1	5.5	5.7	4.3	3.9

All species combined

	0800	0900	1000	1100	Noon	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	MID	0100	0200	0300	0400	0500	0600	0700
1992	6.0	4.8	4.0	3.8	3.2	4.2	3.7	3.6	3.5	2.7	1.7	1.0	0.8	3.9	10.6	9.8	4.3	3.2	3.3	4.3	3.7	4.1	4.3	5.2
1993	4.9	3.6	3.3	2.8	2.8	2.3	2.3	2.8	2.4	2.3	1.8	3.0	4.1	5.6	9.1	6.6	4.8	5.0	4.5	4.6	4.6	5.1	6.1	5.7
1994	5.7	4.8	3.6	3.0	2.7	2.9	3.7	3.8	3.2	2.1	1.6	0.9	1.5	3.2	11.1	9.7	4.3	3.5	4.3	4.5	4.0	4.8	4.5	6.8
1995	3.3	2.7	2.5	2.5	2.4	3.3	3.0	2.8	2.3	2.1	1.5	1.6	2.4	3.0	14.8	10.0	5.3	4.9	7.4	5.3	4.6	4.9	3.8	3.4
AVG	5.1	4.1	3.3	2.9	2.7	3.0	3.2	3.3	2.9	2.2	1.6	1.6	2.3	3.8	11.2	9.0	4.6	4.1	4.8	4.7	4.2	4.8	4.7	5.7
MIN	3.3	2.7	2.5	2.5	2.4	2.3	2.3	2.8	2.3	2.1	1.5	0.9	0.8	3.0	9.1	6.6	4.3	3.2	3.3	4.3	3.7	4.1	3.8	3.4
MAX	6.0	4.8	4.0	3.8	3.2	4.2	3.7	3.8	3.5	2.7	1.8	3.0	4.1	5.6	14.8	10.0	5.3	5.0	7.4	5.3	4.6	5.1	6.1	6.8

Table D-4. PH1 annual descaling and mortality data, 1988-2000.

	YEARLING CHINOOK					SUBYEARLING CHINOOK				
YEAR	SAMPLE	DESC	%DESC	MORT	%MORT	SAMPLE	DESC	%DESC	MORT	%MORT
1988	28,958	1,265	4.4	67	0.2	96,416	1,659	1.7	337	0.4
1989	27,934	1,164	4.2	22	0.1	98,571	2,119	2.2	361	0.4
1990	23,821	1,675	7.0	34	0.1	80,446	1,956	2.4	358	0.5
1991	29,409	2,741	9.3	24	0.1	83,240	2,383	2.9	257	0.3
1992	42,523	1,952	4.6	62	0.2	112,037	2,517	2.3	301	0.3
1993	52,623	2,050	3.9	51	0.1	130,616	1,657	1.3	611	0.5
1994	34,361	896	2.6	58	0.2	125,967	999	0.8	600	0.5
1995	19,557	1,310	6.7	27	0.1	60,356	651	1.1	189	0.3
1996	7,246	370	5.1	13	0.2	27,113	254	0.9	82	0.3
1997	5,938	239	4.0	26	0.4	44,024	595	1.4	192	0.4
1998	6,850	337	4.9	20	0.3	30,835	485	1.6	127	0.4
1999	16,279	482	3.2	37	0.2	35,637	339	1.0	71	0.2
2000	5,104	471	9.3	30	0.6	7,477	253	3.4	77	1.0
TOTAL	300,603	14,481	4.8	441	0.2	925,258	15,614	1.7	3,486	0.4

	UNCLIPPED STEELHEAD					CLIPPED STEELHEAD				
YEAR	SAMPLE	DESC	%DESC	MORT	%MORT	SAMPLE	DESC	%DESC	MORT	%MORT
1988*	7,478	452	6.1	18	0.2					
1989*	12,240	536	4.4	13	0.1					
1990	3,894	232	6.0	5	0.1	5,521	818	14.9	25	0.5
1991	2,772	194	7.0	0	0.0	5,502	1,036	18.8	4	0.1
1992	2,837	194	6.8	3	0.1	3,767	487	12.9	2	0.1
1993	4,025	96	2.4	2	0.0	7,456	622	8.3	2	0.0
1994	3,730	102	2.7	2	0.1	3,981	290	7.3	2	0.1
1995	1,240	32	2.6	0	0.0	3,737	397	10.6	5	0.1
1996	1,821	44	2.4	1	0.1	5,075	369	7.3	5	0.1
1997	3,616	35	1.0	7	0.2	9,285	635	6.8	9	0.1
1998	2,587	56	2.2	1	0.0	3,294	208	6.3	5	0.2
1999	2,549	29	1.1	4	0.2	5,647	170	3.0	4	0.1
2000	1,314	104	7.9	0	0.0	1,378	173	12.6	1	0.1
TOTAL	46,240	1,973	4.3	52	0.1	47,618	4,862	10.2	59	0.1

	COHO					SOCKEYE				
DATE	SAMPLE	DESC	%DESC	MORT	%MORT	SAMPLE	DESC	%DESC	MORT	%MORT
1988	40,776	1,340	3.3	24	0.1	4,588	1,077	23.6	28	0.6
1989	29,747	998	3.4	5	0.0	7,723	1,319	17.1	11	0.1
1990	43,032	2,325	5.4	30	0.1	4,537	1,710	38.1	45	1.0
1991	23,842	1,059	4.4	5	0.0	4,462	1,205	27.1	9	0.2
1992	23,971	1,485	6.2	24	0.1	638	83	13.0	0	0.0
1993	28,243	649	2.3	6	0.0	4,939	803	16.3	16	0.3
1994	22,378	430	1.9	27	0.1	2,965	322	10.9	2	0.1
1995	11,868	258	2.2	16	0.1	2,184	305	14.1	16	0.7
1996	12,689	320	2.5	8	0.1	694	43	6.2	4	0.6
1997	12,346	363	2.9	16	0.1	589	84	14.3	1	0.2
1998	6,272	176	2.8	2	0.0	1,737	299	17.3	6	0.3
1999	8,411	94	1.1	31	0.4	2,118	165	7.4	16	0.7
2000	2,452	101	4.2	22	0.9	223	51	23.0	1	0.4
TOTAL	255,164	9,403	3.7	163	0.1	35,056	7,250	20.8	138	0.4

* Wild and hatchery steelhead numbers are combined for 1988-89.

Sampling in 1992-1995 was conducted 24 hours per day.

Sampling in 2000 was conducted 3 times weekly for GBT exam collection purposes.

Table D-5. PH2 annual descaling and mortality data, 1988-2000.

	YEARLING CHINOOK					SUBYEARLING CHINOOK				
YEAR	SAMPLE	DESC	%DESC	MORT	%MORT	SAMPLE	DESC	%DESC	MORT	%MORT
1988	7,076	361	5.2	147	2.1	9,711	185	2.0	390	4.0
1989	15,579	671	4.4	478	3.1	12,144	74	0.6	176	1.5
1990	5,267	278	5.3	36	0.7	2,669	8	0.3	10	0.4
1991	17,943	1,780	10.0	143	0.8	7,846	140	1.8	39	0.5
1992	358	36	10.2	5	1.4	1,452	42	2.9	6	0.4
1993	5,468	393	7.2	36	0.7	5,545	65	1.2	36	0.7
1994	4,172	208	5.1	54	1.3	5,703	80	1.4	138	2.4
1995	2,709	180	6.7	16	0.6	4,696	108	2.3	31	0.7
1996	3,059	304	10.0	16	0.5	8,662	176	2.0	29	0.3
1997	1,311	72	5.5	2	0.2	7,415	138	1.9	52	0.7
1998	3,355	146	4.4	9	0.3	5,519	57	1.0	24	0.4
1999^										
2000	17,337	576	3.3	80	0.5	19,683	101	0.5	68	0.3
TOTAL	83,634	5,005	6.1	1022	1.2	91,045	1,174	1.3	999	1.1

	UNCLIPPED STEELHEAD					CLIPPED STEELHEAD				
YEAR	SAMPLE	DESC	%DESC	MORT	%MORT	SAMPLE	DESC	%DESC	MORT	%MORT
1988*	762	43	5.7	12	1.6					
1989*	2,049	84	4.2	31	1.5					
1990	206	5	2.5	4	1.9	176	25	15.6	16	9.1
1991	921	88	9.6	6	0.7	1,614	321	20.1	17	1.1
1992	3	0	0.0	0	0.0	4	0	0.0	0	0.0
1993	255	16	6.3	0	0.0	462	79	17.1	1	0.2
1994	279	31	11.2	1	0.4	218	5	2.3	2	0.9
1995	65	4	6.3	1	1.5	184	35	19.1	1	0.5
1996	182	1	0.6	1	0.5	531	48	9.1	1	0.2
1997	461	14	3.0	0	0.0	1,596	134	8.4	3	0.2
1998	695	23	3.3	2	0.3	720	38	5.3	2	0.3
1999^										
2000	5,047	57	1.1	3	0.1	2,839	143	5.0	7	0.2
TOTAL	10,925	366	3.4	61	0.6	8,344	828	10.0	50	0.6

	COHO					SOCKEYE				
YEAR	SAMPLE	DESC	%DESC	MORT	%MORT	SAMPLE	DESC	%DESC	MORT	%MORT
1988	5,556	195	3.6	61	1.1	237	33	16.4	36	15.2
1989	9,192	282	3.1	207	2.3	2,247	343	19.1	451	20.1
1990	5,498	204	3.7	16	0.3	137	25	18.5	2	1.5
1991	7,284	448	6.2	33	0.5	2,575	761	30.3	61	2.4
1992	119	9	7.6	1	0.8	1	1	100.0	0	0.0
1993	3,621	162	4.5	7	0.2	623	126	20.4	4	0.6
1994	2,678	69	2.6	18	0.7	400	75	18.9	4	1.0
1995	1,075	29	2.7	5	0.5	348	61	18.0	9	2.6
1996	4,296	113	2.6	18	0.4	196	33	17.2	4	2.0
1997	2,169	54	2.5	6	0.3	520	118	23.0	6	1.2
1998	1,303	75	5.8	9	0.7	711	80	11.3	0	0.0
1999^										
2000	11,596	182	1.6	33	0.3	407	35	8.7	3	0.7
TOTAL	54,387	1,822	3.4	414	0.8	8,402	1,691	21.6	580	6.9

* Wild and hatchery steelhead numbers are combined for 1988-89.

^ No sampling was conducted in PH2 in 1999.

Table D-6. PH1 annual condition subsampling data, expressed as a percent of total, 1988-2000.

YEAR	NO.	INJURY			DISEASE				BIRD	3-19%
	SMPLD	HEAD	OPERC.	BODY	PAR.	COL.	FUN.	BKD	PRED	DESC
Yearling Chinook										
1988	1856	0.27	0.05	0.59	0.05	N/A	0.11	0.00	0.16	4.20
1989	2327	0.39	0.39	1.12	0.21	N/A	0.34	0.17	0.43	8.04
1990	3111	0.10	0.13	0.84	0.13	N/A	0.51	0.23	0.58	9.64
1991	2158	0.42	0.32	0.65	0.00	N/A	0.23	0.23	0.42	5.38
1992	2190	0.41	0.23	0.73	0.27	N/A	0.37	0.87	0.50	6.39
1993	2934	0.00	0.65	3.03	0.55	N/A	0.85	0.00	0.55	14.25
1994	4018	0.00	0.37	1.84	0.20	N/A	0.77	0.00	1.14	9.98
1995	2648	1.44	1.36	4.80	0.98	N/A	0.87	1.13	0.98	14.31
1996	2305	0.52	0.56	1.52	0.22	0.00	0.48	0.43	1.13	12.75
1997	1591	0.19	0.44	1.19	0.06	0.00	0.31	0.13	0.94	9.99
1998	1687	0.41	0.24	0.65	0.18	0.00	1.01	0.24	0.95	13.04
1999	3429	0.55	0.82	0.73	0.17	0.00	0.93	0.90	1.84	14.09
2000	2601	0.77	0.69	0.54	0.12	0.00	1.96	0.85	1.35	13.99
Wild Steelhead										
1988	2148	0.09	0.05	0.28	0.05	N/A	0.61	0.00	0.05	3.17
1989	2626	0.42	0.23	0.42	0.19	N/A	0.30	0.00	0.19	6.28
1990	3468	0.09	0.09	0.43	0.09	N/A	0.40	0.06	0.46	7.73
1991	1967	0.20	0.20	0.36	0.20	N/A	0.15	0.10	0.31	1.83
1992	1883	0.27	0.37	0.32	0.16	N/A	0.64	0.00	0.32	5.47
1993	2227	0.00	0.45	1.93	0.27	N/A	0.90	0.00	0.31	5.34
1994	2725	0.00	0.22	1.10	0.11	N/A	1.10	0.00	0.33	6.68
1995	2574	0.62	0.35	3.11	0.85	N/A	1.09	0.12	0.47	7.58
1996	2720	0.18	0.18	0.55	0.18	0.11	0.37	0.04	1.03	10.22
1997	2347	0.30	0.09	0.60	0.09	0.00	0.30	0.04	0.55	7.93
1998	768	0.65	0.52	0.91	4.56	0.00	0.39	0.00	1.95	10.94
1999	1067	0.28	0.47	0.47	9.75	0.00	0.84	0.00	1.78	9.37
2000	1022	0.88	0.88	0.88	8.71	0.10	0.88	0.00	6.36	13.80
Coho										
1988	1403	0.78	0.29	0.78	1.50	0.50	0.00	0.00	3.85	7.48
1989	2319	0.43	0.73	1.21	3.32	N/A	1.03	0.04	2.50	10.48
1990	1366	0.88	0.73	1.46	0.15	N/A	3.07	0.00	6.15	21.52
1991	1024	0.29	4.39	0.88	0.20	N/A	0.78	0.20	3.81	9.67
1992	735	0.41	2.99	1.09	0.41	N/A	1.22	0.00	4.76	11.02
1993	1669	0.00	1.86	3.18	2.22	N/A	1.44	0.00	0.00	16.12
1994	1595	0.00	3.13	3.64	0.94	N/A	0.56	0.00	8.40	21.63
1995	1278	1.88	3.36	5.71	2.11	N/A	3.05	0.08	8.29	25.67
1996	1789	0.28	3.47	2.12	0.11	0.00	0.78	0.06	10.01	27.56
1997	1978	0.01	0.03	0.02	0.05	0.15	0.40	0.00	6.77	25.28
1998	1960	0.41	0.31	0.36	0.15	0.00	1.12	0.05	0.36	7.60
1999	2643	0.30	0.38	0.19	0.15	0.00	3.67	0.08	0.72	6.36
2000	178	0.56	0.56	1.69	0.56	0.00	2.81	0.00	0.56	5.06

YEAR	NO.	INJURY			DISEASE				BIRD	3-19%
	SMPLD	HEAD	OPERC.	BODY	PAR.	COL.	FUN.	BKD	PRED	DESC
Subyearling Chinook										
1988	3451	0.09	0.03	0.67	0.03	N/A	0.09	0.00	0.12	2.98
1989	8481	0.15	0.09	1.29	0.15	N/A	0.05	0.12	0.04	4.55
1990	6929	0.10	0.14	0.64	0.16	N/A	0.07	0.32	0.27	1.93
1991	4404	0.23	0.11	0.43	0.30	N/A	0.05	0.52	0.09	2.45
1992	4422	0.09	0.25	0.34	0.41	N/A	0.05	0.79	0.47	3.55
1993	8343	0.00	0.36	3.12	0.31	N/A	0.08	0.00	0.11	7.76
1994	7149	0.00	0.29	0.92	0.10	N/A	0.10	0.00	0.08	4.00
1995	5230	0.33	0.44	1.97	0.23	N/A	0.13	0.17	0.13	5.35
1996	4080	0.32	0.47	0.69	0.12	0.00	0.17	0.05	0.22	4.56
1997	4893	0.25	0.49	0.76	0.25	0.02	0.16	0.14	0.16	5.89
1998	3324	0.33	0.48	1.08	0.30	0.00	0.39	0.15	0.21	8.33
1999	4513	0.22	0.55	0.69	0.02	0.00	0.20	0.00	0.24	6.16
2000	3097	0.45	1.00	1.07	0.06	0.00	0.52	0.10	0.45	7.20
Hatchery Steelhead										
1988										
1989										
1990	1042	0.38	0.19	1.44	4.03	N/A	1.25	0.00	2.11	10.08
1991	706	0.85	0.71	1.56	8.22	N/A	0.71	0.00	1.56	2.55
1992	590	0.17	0.17	0.68	5.59	N/A	0.34	0.00	2.20	5.59
1993	1250	0.00	0.24	1.60	6.64	N/A	0.72	0.00	5.84	6.56
1994	1429	0.00	0.49	2.59	8.33	N/A	0.49	0.00	2.80	9.24
1995	419	1.67	1.19	2.86	19.33	N/A	0.24	0.00	3.10	9.79
1996	789	0.25	0.63	0.38	8.11	0.00	0.25	0.00	1.52	9.00
1997	1306	0.61	0.77	1.23	4.59	0.00	0.23	0.00	2.07	6.89
1998	1011	0.69	2.77	2.08	0.30	0.00	1.58	0.00	7.52	25.32
1999	2158	0.32	3.06	0.93	0.42	0.00	1.02	0.00	5.70	19.32
2000	1057	0.95	2.55	1.89	0.47	0.00	0.57	0.00	11.54	20.06
Sockeye										
1988	686	0.00	0.00	0.00	0.00	N/A	0.00	0.00	0.00	9.62
1989	1397	0.50	0.50	0.36	0.00	N/A	0.07	0.07	0.07	16.11
1990	1425	1.26	0.77	0.49	0.07	N/A	0.14	0.07	0.14	14.88
1991	621	0.97	2.25	0.81	0.00	N/A	0.32	0.00	0.32	11.27
1992	131	0.76	2.29	0.76	0.00	N/A	0.00	0.00	0.00	17.56
1993	940	0.11	2.34	3.09	0.32	N/A	0.43	0.00	0.21	23.83
1994	1047	0.00	1.91	1.43	0.00	N/A	0.29	0.00	0.19	26.65
1995	829	0.97	2.41	1.09	0.00	N/A	0.72	0.00	0.24	23.88
1996	307	0.00	1.30	1.63	0.33	0.00	0.00	0.00	0.00	13.36
1997	215	1.40	2.79	0.47	0.00	0.00	0.00	0.00	0.00	25.58
1998	595	2.02	2.86	0.34	0.00	0.00	1.18	0.00	0.00	26.55
1999	869	1.61	3.45	0.35	0.00	0.00	0.35	0.00	0.12	31.42
2000	18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	27.78

Table D-7. PH2 annual condition subsampling data, expressed as a percent of total, 2000.

YEAR	NO.	INJURY			DISEASE				BIRD	3-19%
	SMPLD	HEAD	OPERC.	BODY	PAR.	COL.	FUN.	BKD	PRED	DESC
Yearling Chinook										
2000	3375	0.12	0.47	0.80	0.30	0.00	0.65	0.21	1.45	18.28
Subyearling Chinook										
2000	3310	0.09	0.33	0.54	0.27	0.03	0.33	0.09	0.42	10.76
Wild Steelhead										
2000	868	0.46	0.23	0.46	5.88	0.00	0.35	0.12	2.88	19.35
Hatchery Steelhead										
2000	1152	0.35	4.25	1.04	0.09	0.00	1.13	0.00	10.85	33.51
Coho										
2000	2788	0.07	0.22	0.36	0.14	0.00	0.93	0.04	0.90	10.72
Sockeye										
2000	192	0.00	1.56	0.52	0.00	0.00	0.00	0.00	0.52	34.38

Table D-8. Annual PIT tag detection totals at Bonneville Dam, 1992-2000.

Species	Run	Rearing Type	1992	1993	1994	1995	1996*	1997^	1998	1999	2000
Chinook	Spring	Hatchery	1	70	48	38	831	2,323	7,563	25,971	12,827
		Wild	1	13	5	13	60	127	832	12,860	2,495
		Unknown	4								18,041
	Summer	Hatchery		6	6	9	273	1,199	2,364	3,205	5,426
		Wild		1	2	5	43	75	604	2,114	1,553
		Unknown							1		
	Fall	Hatchery		1		20	140	1,608	5,024	3,934	2,064
		Wild		2	3	2	2	117	79	230	58
		Unknown	2					7,127	3,891	24,167	6,693
	Unknown	Hatchery	4	15	7	131	1,057	161	5,018	14,124	4,277
		Wild		6	2	60	180	2	1,033	2,846	5,445
		Unknown	5	9	4	2	223	78	1,883	3,102	192
Chinook Total			17	123	77	280	2,809	12,817	28,292	92,553	59,071
Steelhead	Spring	Hatchery					18			1	
		Wild								188	
	Summer	Hatchery		16	19	46	1,454	7,242	4,747	28,118	9,312
		Wild		5	4	3	200	423	1,482	3,136	7,934
		Unknown		1			2	8	5	1	
	Unknown	Hatchery							9		
Steelhead Total			0	22	23	49	1,674	7,673	6,243	31,444	17,246
Coho	Spring	Hatchery						102		1	9
		Unknown								5,040	9,010
	Summer	Unknown							1		
	Fall	Hatchery					13	76	269	1,333	698
		Wild									12
		Unknown							68	246	1
	Unknown	Hatchery							117	2	
		Unknown						4,789	7,796		
Coho Total							13	4,967	8,251	6,622	9,730
Sockeye	Spring	Hatchery		6							
	Summer	Hatchery					11	5	161	101	81
		Wild					2	1	12	10	7
		Unknown									635
	Unknown	Hatchery	2		1		23	11	12	20	2
		Wild		4	4	1	16	33	158	248	20
		Unknown							2		21
Sockeye Total			2	10	5	1	52	50	345	379	766
Unknown	Unknown	Unknown									29
Unknown Total											29
TOTALS (all detections combined) =			**25**	**155**	**105**	**330**	**4,548**	**25,507**	**43,131**	**130,998**	**86,842**

* Beginning in 1996, all PH1 flat plate detections added.

^ Beginning in 1997, all PH2 full bypass detections added.

Table D-9. PH1 annual mark recapture data, 1988-1999 and PH2 in 2000.

Year	Yearling Chinook	Subyearling Chinook	Unclipped Steelhead[1]	Clipped Steelhead	Coho	Sockeye	Total
Brands							
1988	425	165		157	2	55	804
1989	521	364		443		16	1,344
1990	286	189		218		6	699
1991	258	235		204	2	48	747
1992	220	212	18	40			490
1993	349	360	6	57		19	791
1994	55	187		27			269
1995	181	147		77			405
1996[2]	91	56		63	1		211
1997[2]				32			32
1998[2]				8			8
1999				1			1
2000[2]							0
Elastomer							
1997[2]	230			181			352
1998[2]	96			165			219
1999	156			29			185
2000[2]	71			14			85

1. Unclipped and clipped steelhead were not differentiated before 1992.
2. Includes data from PH1 and PH2.

Table D-10. PH1 adult salmonid fallbacks, 1988-2000.

Year	Chinook	Steelhead	Coho	Sockeye	Total
1988	1	1			2
1989	4	1	1	1	7
1990	1				1
1991	3	5		7	15
1992	1				1
1993	4				4
1994	2	1			3
1995	1	6			7
1996	1	3		1	5
1997		1		1	2
1998					0
1999					0
2000					0

Table D-11. PH2 adult salmonid fallbacks.

Year	Chinook					
	Jack	Minijack	Steelhead	Coho	Sockeye	Total
2000	11	1	1			13

Table D-12. PH1 incidental catch summary using collection estimates, 1988 - 2000.

Year	American Shad		Pacific Lamprey		Stickleback	Peamouth	Northern Squawfish	Redside Shiner	S-Mouth Bass	Sculpin Species	Mountain Whitefish
	Juvenile	Adult	Juvenile	Adult							
1988	2,361	17	204	37	1,017	754	243	264	228	177	33
1989	435,653	39	34,756	63	2,473	1,413	698	384	5	193	34
1990	2,939,363	0	1,909	0	4,527	224	520	56	88	47	58
1991	1,454,524	8	4,567	4	1,862	849	889	224	31	12	121
1992	4,479,820	46	531	86	6,581	1,053	672	67	162	136	41
1993	288,463	148	6,269	78	6,583	1,603	264	377	251	268	75
1994	252,474	85	1,074	47	78,799	4,669	311	269	122	56	65
1995	414,487	1,130	4,335	213	5,931	2,227	979	677	567	233	665
1996	318,190	104	146	60	88	823	21	259	59	60	73
1997	437,715	1,097	945	48	175	1,175	50	128	805	87	113
1998	820,864	64	464	26	81	899	124	39	52	4	84
1999	187,300	75	189	23	91	385	47	85	43	21	10
2000*	493	5	7	3	8	178	3	0	0	1	0

* Sampling effort reduced to condition monitoring, no collection or index estimates calculated.

Note: All values are based on 8 hour samples except for the years 1992-1995, which are based on 24 hour sample numbers.

Table D-13. PH2 incidental catch summary using collection estimates .

Year	American Shad		Pacific Lamprey		Stickleback	Peamouth	Northern Squawfish	Redside Shiner	S-Mouth Bass	Sculpin Species	Mountain Whitefish
	Juvenile	Adult	Juvenile	Adult							
2000	4,359,372	930	7,500	39	319	3,416	356	10	109	454	0

Table D-14. PH1 chinook and coho fry catch summary, 1992-2000.

YEAR	# of sample hours/day	Chinook		Coho	
		Sampled	Collected	Sampled	Collected
1992	24	2,742	15,165		
1993	24	5,659	61,457		
1994	24	1,538	14,731	72	459
1995	24	1,917	30,440	156	1,389
1996	8	79	647	9	97
1997	8	459	3,761	13	105
1998	8	510	8,116	28	452
1999	8	154	1,451	10	64
2000[1]	6-8	18	NA	5	NA

[1] Samples were collected infrequently in 2000, and collection estimates were not made.

Table D-15. PH2 chinook and coho fry catch summary, 1997 -2000.

YEAR	# of sample hours/day	Chinook		Coho	
		Sampled	Collected	Sampled	Collected
1997	Up to 24	648	NA	0	NA
1998	Up to 24	316	NA	18	NA
1999	NA				
2000[1]	24	1,118	18,790	6	40

[1] Sampling conducted at the new juvenile monitoring facility.

Table D-16. PH1 smolt monitoring program summary, 1986-2000.

					Yearling Chinook					Subyearling Chinook					Coho				
						Collection		Index			Collection		Index			Collection		Index	
Year	Dates	Sampling Effort	Sub-Sampling	Sample Rate	Sample #	Hourly	Daily	Hourly	Daily	Sample #	Hourly	Daily	Hourly	Daily	Sample #	Hourly	Daily	Hourly	Daily
1986	5/12-11/26	8hr, 5 d/wk	YES	-	9,495	NA	48,282	NA	NA	23,252	NA	86,220	NA	NA	11,538	NA	54,181	NA	NA
1987	3/13-11/20	8hr, 5 d/wk	YES	-	28,828	NA	120,108	NA	NA	61,925	NA	371,000	NA	NA	23,188	NA	102,228	NA	NA
1988	3/15-11/30	8hr/day	YES	-	26,955	NA	301,479	NA	365,812	96,413	NA	580,644	NA	724,102	40,750	NA	419,286	NA	599,194
1989	3/15-11/30	8hr/day	YES	.1-.25	27,935	NA	223,134	NA	435,455	98,521	NA	1,332,736	NA	1,756,794	29,746	NA	257,244	NA	491,618
1990	3/12-11/30	8hr/day	YES	.0167-.2	23,843	NA	196,216	NA	332,792	80,422	NA	658,702	NA	1,219,778	43,030	NA	365,826	NA	677,413
1991	3/15-11/30	8hr/day	YES	.0167-.2	29,374	NA	242,016	NA	609,411	83,189	NA	604,368	NA	1,257,388	23,842	NA	216,330	NA	575,098
1992	3/13-11/20	24hr/day	YES	.0167-.2	42,523	NA	284,983	799,800	723,655	112,037	NA	882,211	2,433,053	2,320,423	23,971	NA	140,403	471,205	388,809
1993	3/17-11/24	24hr/day	YES	.0167-.2	52,623	707,748	715,905	2,255,149	2,168,019	130,615	1,190,261	1,181,615	4,872,526	4,339,394	28,243	421,432	392,627	1,596,578	1,250,698
1994	3/10-10/31	24hr/day	YES	.0167-.2	34,362	242,624	248,741	789,593	779,713	125,967	1,361,893	1,360,832	3,810,943	3,607,383	22,378	205,520	201,310	699,119	626,443
1995	3/11-10/31	24hr/day	YES	.0167-.2	19,557	496,882	500,804	1,784,311	1,776,344	60,356	1,001,033	994,015	3,936,028	3,406,412	11,868	303,527	301,950	1,159,892	1,104,471
1996	3/11-10/31	8hr/day	YES	.0167-.2	7,825	82,434	77,780	470,119	360,961	29,556	350,426	432,364	1,921,906	1,593,073	13,076	158,438	156,957	863,827	675,605
1997	3/17-10/30	8hr/day	YES	.0167-.2	5,938	56,896	56,891	279,280	286,666	44,024	342,207	342,192	1,509,895	1,501,962	12,346	128,034	128,031	681,513	706,780
1998	3/9-10/31	8hr/day	YES	.00833-.25	6,850	97,577	97,581	381,879	346,281	30,835	450,646	450,650	1,875,090	1,591,883	6,272	121,695	121,695	582,096	513,643
1999	3/13-10/31	8hr/day	YES	.00833-.25	15,279	NA	165,918	NA	638,606	35,637	NA	474,874	NA	1,692,665	8,411	NA	98,370	NA	375,644
2000^	4/3-8/31	6-8hr/day	NO	-	5,104	-	-	-	-	7,477	-	-	-	-	2,452	-	-	-	-

	Unclipped Steelhead				Clipped Steelhead					Sockeye					Total				
	Collection		Index			Collection		Index			Collection		Index			Collection		Index	
Sample #	Hourly	Daily	Hourly	Daily	Sample #	Hourly	Daily	Hourly	Daily	Sample #	Hourly	Daily	Hourly	Daily	Sample #	Hourly	Daily	Hourly	Daily
*	NA	*	NA	NA	3,753	NA	19,181	NA	NA	2,883	NA	14,350	NA	NA	50,921	NA	222,214	NA	NA
*	NA	*	NA	NA	8,760	NA	38,306	NA	NA	4,079	NA	18,733	NA	NA	126,780	NA	650,375	NA	NA
*	NA	*	NA	*	7,473	NA	75,662	NA	103,701	4,587	NA	52,023	NA	77,921	176,178	NA	1,429,094	NA	1,870,730
*	NA	*	NA	*	12,240	NA	106,787	NA	206,226	7,723	NA	72,962	NA	138,310	176,165	NA	1,992,863	NA	3,028,403
3,894	NA	36,812	NA	62,826	5,525	NA	64,400	NA	65,056	4,537	NA	42,633	NA	81,403	161,251	NA	1,364,589	NA	2,439,268
2,775	NA	26,295	NA	74,438	5,504	NA	54,528	NA	155,754	4,462	NA	47,722	NA	147,174	149,146	NA	1,191,259	NA	2,819,263
2,837	NA	16,503	60,823	46,098	3,767	NA	21,915	81,871	62,486	638	NA	3,872	13,196	10,835	185,773	NA	1,349,887	3,859,948	3,552,306
4,025	77,143	74,138	258,236	226,120	7,456	190,608	185,240	618,692	563,884	4,939	184,129	178,245	575,586	538,837	227,901	2,771,321	2,727,770	10,176,767	9,086,952
3,730	29,422	29,796	99,490	93,520	3,981	33,233	33,827	112,506	105,693	2,965	29,845	27,945	106,584	87,146	193,383	1,902,537	1,902,451	5,618,235	5,299,898
1,240	30,225	29,963	111,694	106,889	3,737	102,933	103,508	394,457	376,571	2,184	67,625	71,990	256,946	263,680	98,942	2,002,225	2,002,230	7,643,328	7,034,367
1,885	22,003	22,787	121,996	101,655	5,083	58,033	58,825	314,846	254,448	703	7,271	7,239	37,409	28,513	58,128	678,605	755,952	3,730,103	3,014,255
3,615	38,830	38,829	200,764	205,873	9,285	105,517	105,516	557,832	575,077	589	5,774	5,765	30,107	31,099	75,797	677,258	677,224	3,259,391	3,307,458
2,587	40,862	40,862	187,255	159,916	3,294	57,078	57,078	276,543	237,299	1,737	26,963	26,963	143,403	114,564	51,575	794,821	794,829	3,446,265	2,963,585
2549	NA	94,322	NA	108,164	5,647	NA	65,488	NA	65,488	2,118	NA	33,100	NA	118,203	69,641	NA	866,584	NA	3,176,429
1,314	-	-	-	-	1,378	-	-	-	-	223	-	-	-	-	17,948	-	-	-	-

* Unclipped and clipped steelhead were not differentiated prior to 1990.

^ Samples were not expanded for collection or index purposes in 2000; condition sampling only.

Table D-17. PH2 smolt monitoring program summary, 1986-2000.

					Yearling Chinook			Subyearling Chinook			Coho		
Year	Dates	Sampling Effort	Sub-Sampling	Sample Rate	Sample #	Collection	Index	Sample #	Collection	Index	Sample #	Collection	Index
1986	3/4-11/25	24 / daily	NO	0.1	10,917			16,844			6,112		
1987	3/10-11/20	24 / 4 days/wk	NO	0.1	6,461			5,438			3,940		
1988	3/17-11/30	24 / daily	NO	0.1	7,068			9,744			5,555		
1989	3/17-11/30	24 / daily	NO	0.1	15,579			12,197			9,192		
1990	3/12-11/30	24 / daily	NO	0.1	5,463			20,469			6,300		
1991	3/15-11/30	24 / daily	NO	0.1	18,372			19,050			8,070		
1992	3/13-11/20	up to 7 / MWF	NO	0.1	358			1,461			119		
1993	3/17-11/24	up to 24 / MWF	NO	0.1	5,468			5,545			3,621		
1994	3/10-10/31	up to 24 / MWF	NO	0.1	4,172			5,703			2,678		
1995	3/11-10/31	up to 24 / MWF	NO	0.1	2,709			4,696			1,075		
1996	3/13-9/13	up to 24 / MWF	NO	0.1	3,059			8,662			4,296		
1997	4/27-9/5	up to 24 / MWF	NO	1	1,311			7,415			2,169		
1998	4/1-10/2	up to 24 / MWF	NO	1	3,355			5,519			1,303		
1999	NA												
2000	3/8-10/31	24 / daily	YES	.0067-.25	17,337	809,700	2,539,355	19,683	1,130,109	3,814,964	11,596	619,676	1,977,601

		Unclipped Steelhead			Clipped Steelhead			Sockeye			Total		
Year	Sample Rate	Sample #	Collection	Index	Sample #	Collection	Index	Sample #	Collection	Index	Sample #	Collection	Index
1986	0.1	*			1,494			2,599			37,966		
1987	0.1	*			823			642			17,304		
1988	0.1	*			762			238			23,367		
1989	0.1	*			2,049			2,247			41,264		
1990	0.1	238			205			164			32,839		
1991	0.1	952			1,630			2,592			50,666		
1992	0.1	3			4			1			1,946		
1993	0.1	255			462			624			15,975		
1994	0.1	218			279			400			13,450		
1995	0.1	65			183			355			9,083		
1996	0.1	182			531			196			16,926		
1997	1	461			1,596			520			13,472		
1998	1	696			720			711			12,304		
1999													
2000	.0067-.25	2,208	89,961	277,538	2,839	121,745	380,008	407	19,717	65,491	54,070	2,790,908	9,054,957

* Unclipped and clipped steelhead were not differentiated prior to 1990.

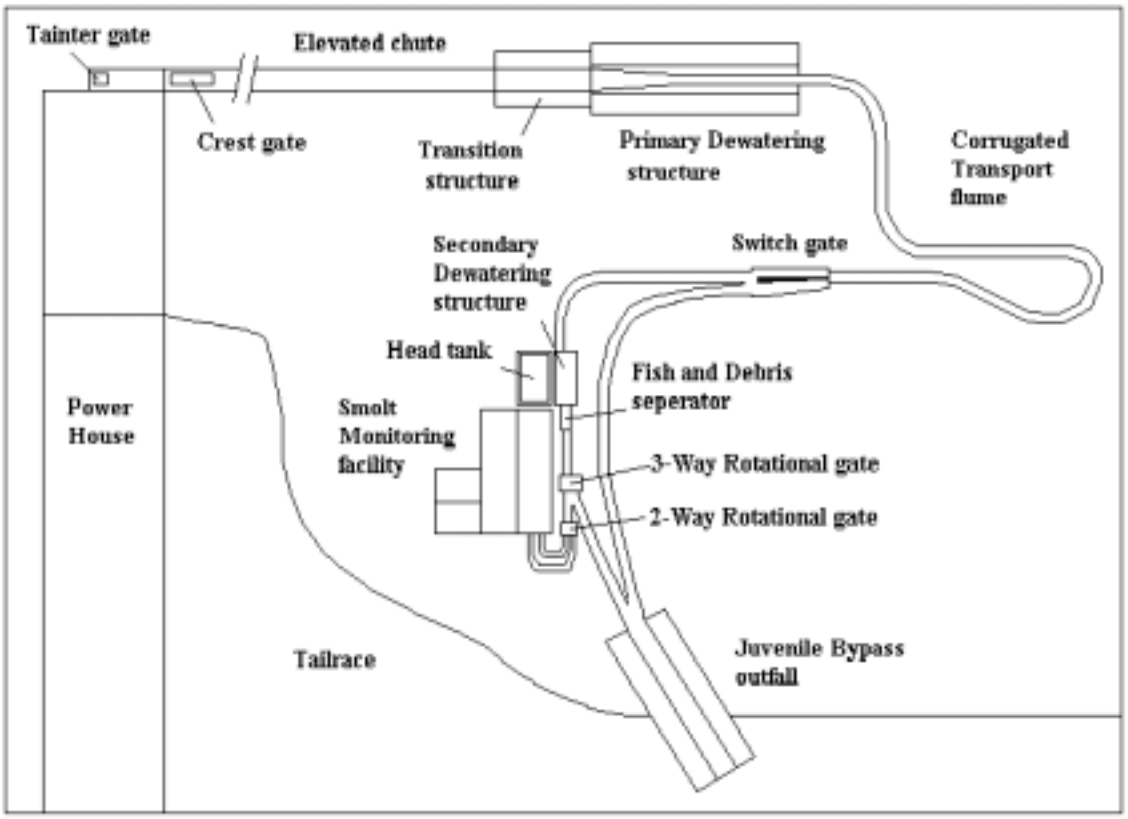

Figure E-1. John Day smolt monitoring facility "footprint", 1998.

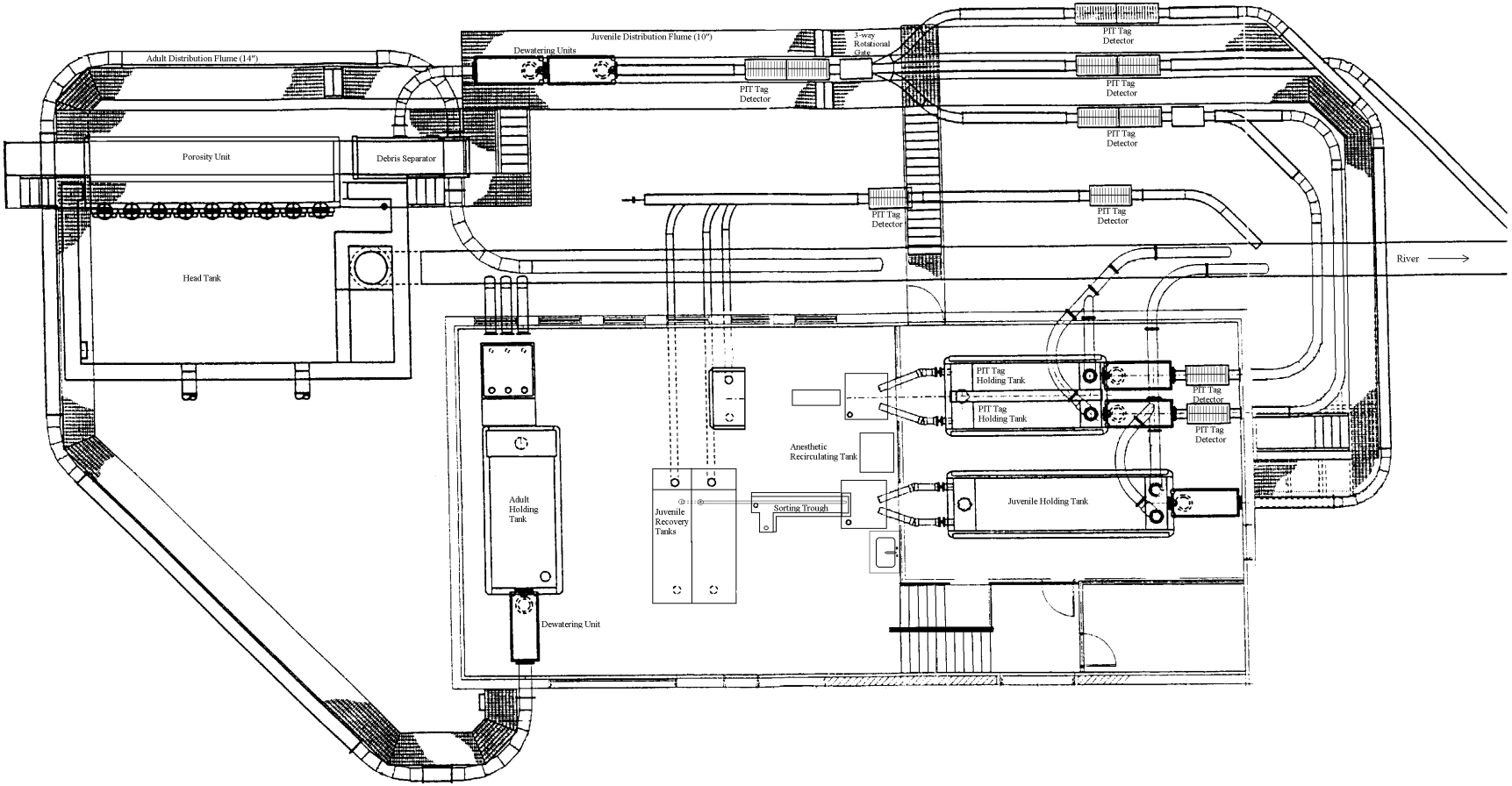

Figure E-2. John Day Smolt Monitoring Facility laboratory layout.

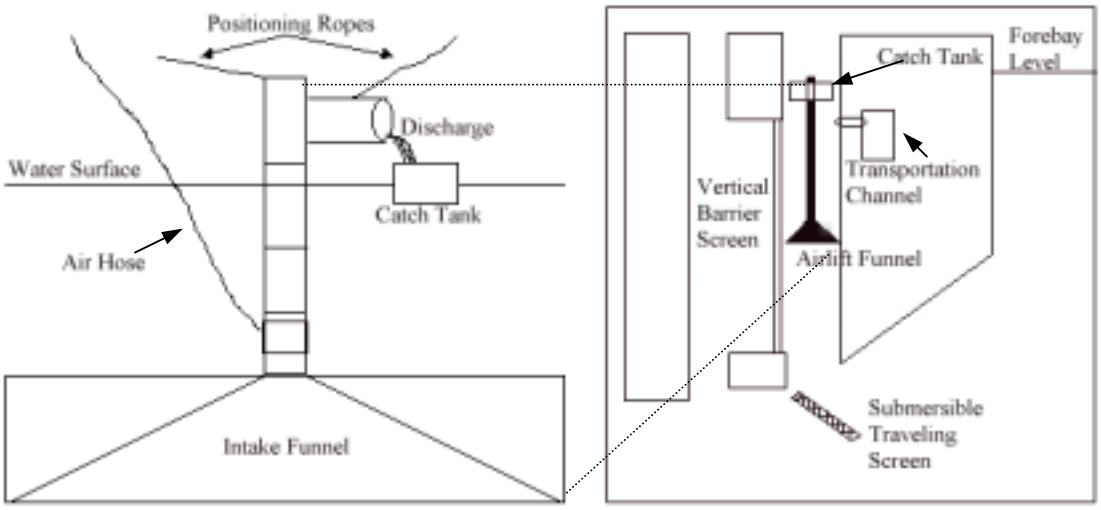

Figure E-3. John Day airlift sampling system , 1985-1997.

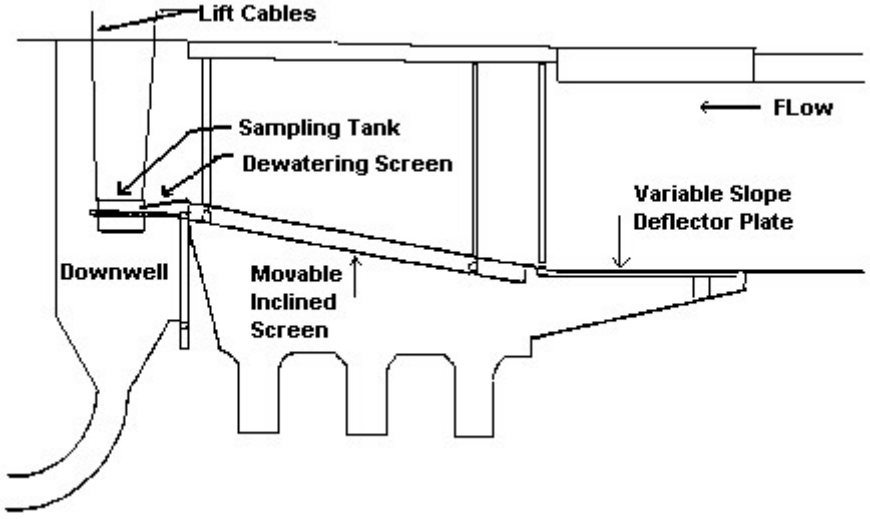

Figure E-4. PH1 inclined screen sampling system.

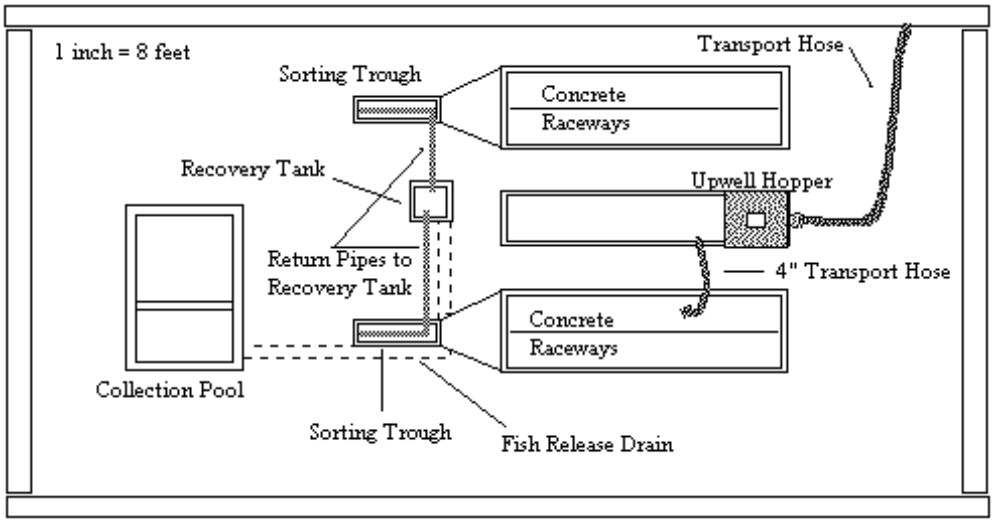

Figure E-5. PH1 laboratory area layout..

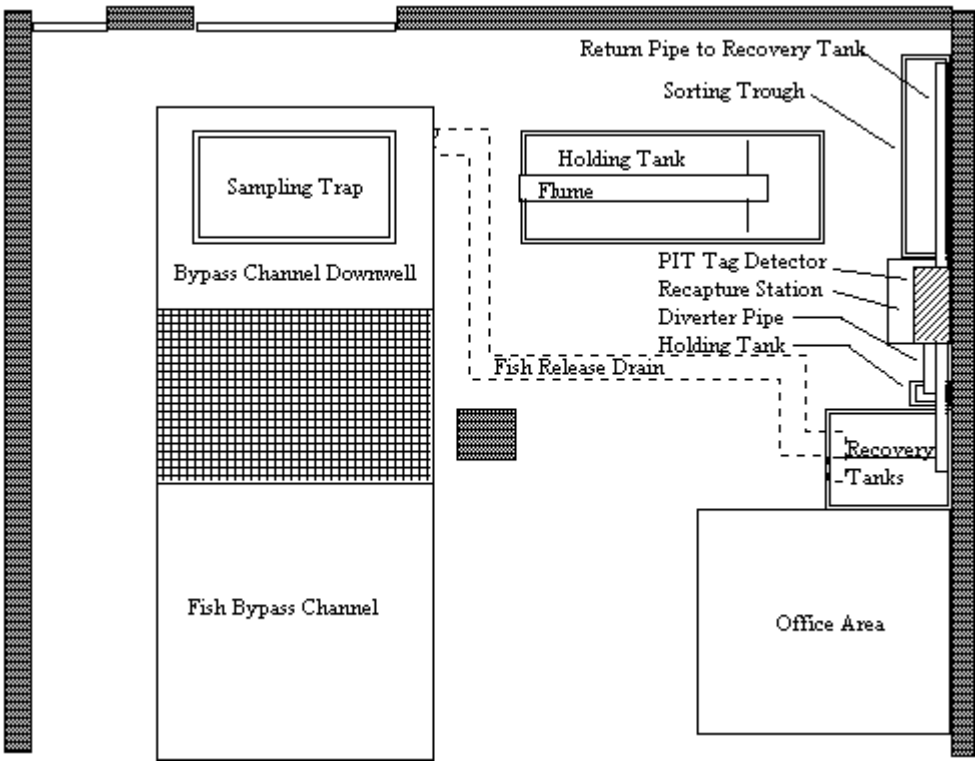

Figure E-6. PH2 laboratory layout, used through 1998.

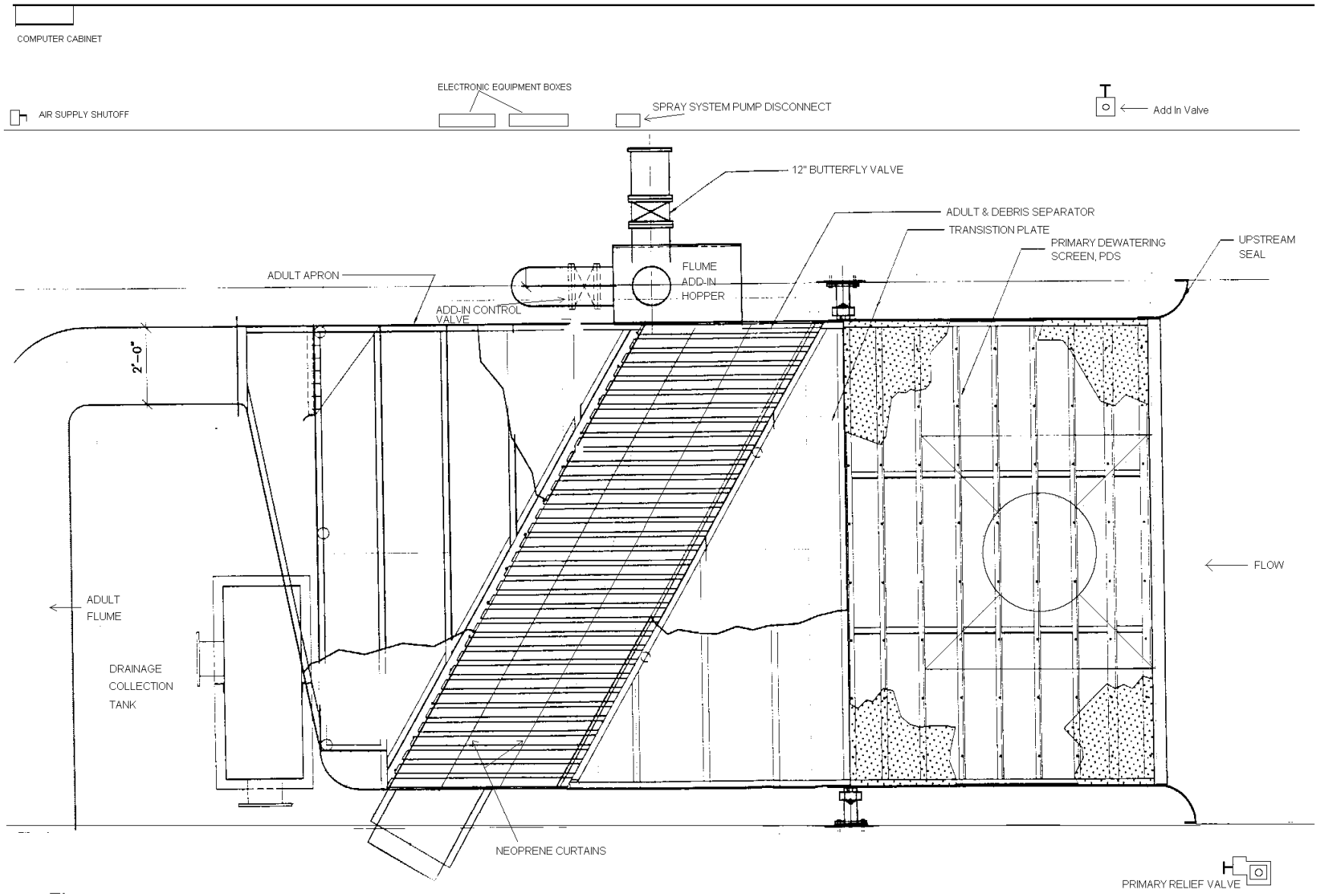

Figure E-7. PH2 PIT tag and sample collection system, top view, 1997-1998. This system was dismantled in 1999 to allow construction of new bypass at PH2.

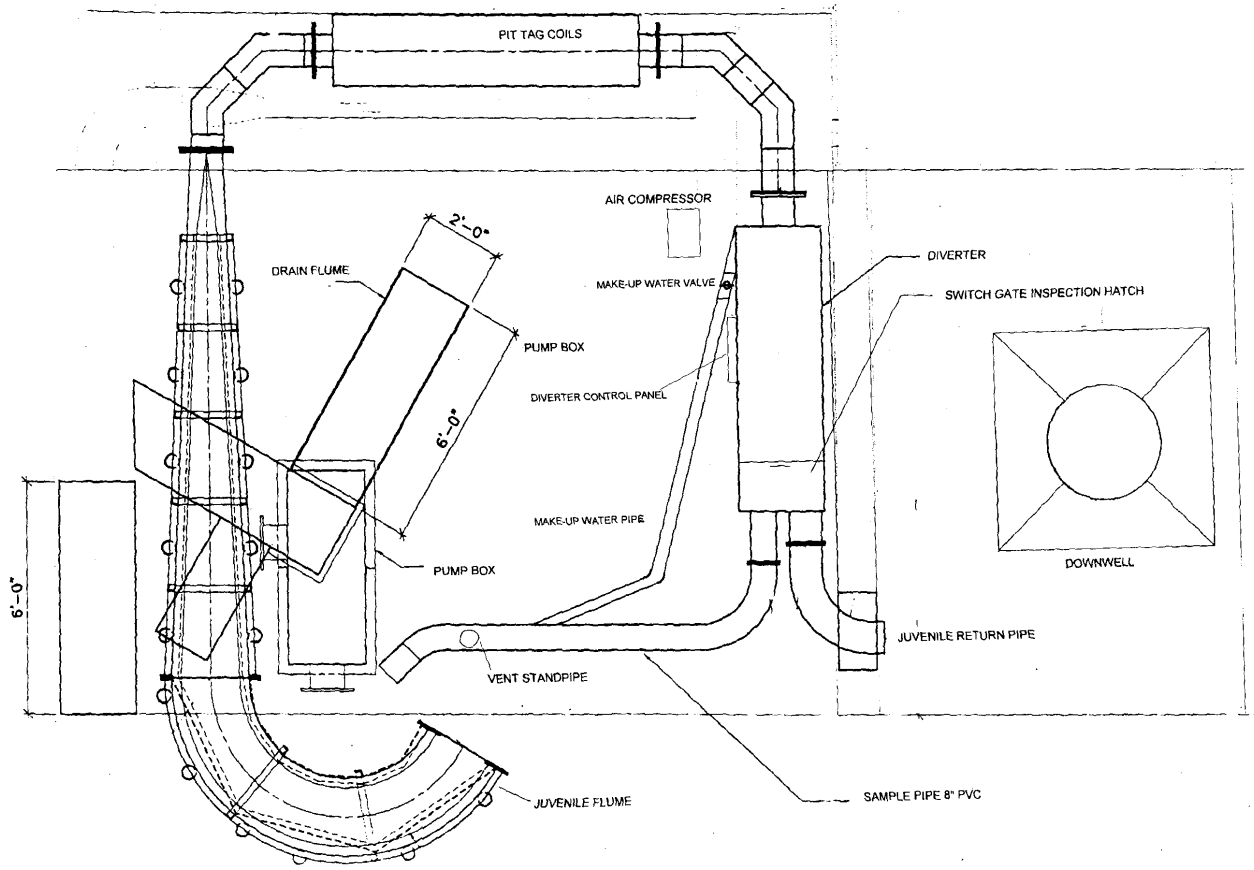

Figure E-8. PH2 PIT tag and collection system, lower level, 1997-1998. This system was dismantled in 1999 to allow construction of new bypass at PH2.