Studies to evaluate the effectiveness of extended-length screens at John Day Dam, 1996

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Coastal Zone and Estuarine Studies Division

Northwest Fisheries Science Center

National Marine Fisheries Service

Seattle, Washington

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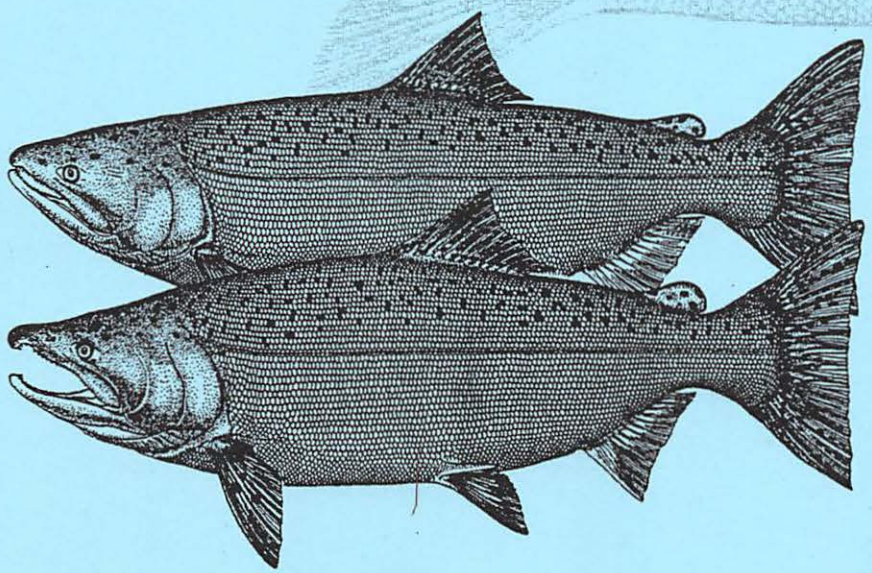
August 1997



STUDIES TO EVALUATE THE EFFECTIVENESS OF EXTENDED-LENGTH SCREENS AT JOHN DAY DAM, 1996

by

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Report of Research

Funded by

U.S. Army Corps of Engineers
Portland District
Delivery Order E96960028

and

Coastal Zone and Estuarine Studies Division
Northwest Fisheries Science Center
National Marine Fisheries Service
National Oceanic and Atmospheric Administration
2725 Montlake Boulevard East
Seattle, Washington 98112-2097

August 1997

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EXECUTIVE SUMMARY

During the 1996 spring and summer juvenile salmonid outmigrations, fish guidance efficiency (FGE) tests using fyke nets, descaling evaluations, and orifice passage efficiency (OPE) tests using a mark and release method were conducted at John Day Dam. Fish guidance efficiency, descaling, and OPE tests were conducted in Turbine Unit 7 (Slot B) which was equipped with an extended-length submersible bar screen (ESBS) and inlet flow vane. Descaling and OPE tests were also conducted in Turbine Unit 6 (Slot B), which was equipped with a standard-length submersible traveling screen (STS). In addition, dip-basket efficiency/gatewell-mortality tests were conducted.

For spring tests, mean FGEs (and 95% confidence intervals) were as follows: yearling chinook salmon 84.0% (± 1.6), steelhead 94.1% (± 1.8), coho salmon 94.8% (± 2.6), and sockeye salmon 78.9% (± 3.8).

Descaling was quite low throughout the spring season. Yearling chinook salmon descaling was 0.4 and 0.8% for the ESBS and STS, respectively.

Mean OPE for yearling chinook salmon was 98.7 and 80.5% with the ESBS and the STS, respectively. The difference in OPE between the ESBS slot and the STS slot was 18.2% (± 5.0), a statistically significant difference ($P < 0.05$).

For summer tests, mean FGE (and 95% confidence interval) for subyearling chinook salmon was 60.2% (± 6.3). Other salmonid species were not present in large enough numbers during the summer tests for statistical analysis.

Descaling was also quite low throughout the summer season. Subyearling chinook salmon descaling was 0.4 and 1.2% for the ESBS and STS, respectively.

Mean OPE for subyearling chinook salmon was 97.1 and 97.5% with the ESBS and the STS, respectively. The difference in OPE between the ESBS slot and the STS slot was -0.4% (± 2.6) and not statistically significant.

A recapture efficiency/mortality test on 1 June in Slot 6B with yearling chinook salmon resulted in a recapture efficiency of 100%. Another recapture efficiency/mortality test on 3 July in Slot 7B with subyearling chinook salmon resulted in a recapture efficiency of 99%. Marked fish were recovered in nearly the same condition as when they were released. Descaling and mortality due to handling were minimal.

INTRODUCTION

John Day Dam, at River Kilometer 347 (River Mile 216), is operated by the U.S. Army Corps of Engineers (COE) and is the third in a series of hydroelectric projects upstream from the mouth of the Columbia River. Completed in 1968, John Day Dam is equipped with 16 turbine units, 20 spillbays, and a navigation lock (Fig. 1).

Initial renovation of the juvenile fish collection and bypass system at John Day Dam began in 1984 and continued through 1986. The fish collection portion of the system consists of standard-length submersible traveling screens (STSs) installed in the gatewell slots to intercept fish passing into the turbine intakes and guide them up into the gatewell slots. The system includes bypass orifices, which lead from the gatewells to an enclosed bypass gallery, and a transportation channel, which carries fish from the gallery to a release area approximately 0.4 km downstream from the dam. A state-of-the-art sampling facility is currently being constructed (scheduled for completion in 1998) to replace a temporary facility that was constructed as part of the 1984-86 juvenile fish bypass system renovation.

In 1985, the National Marine Fisheries Service (NMFS), under contract to the COE, began a series of studies to evaluate the partially finished fish passage system and sampling facilities (Krcma et al. 1986). The fish guidance efficiency (FGE) of the STSs was estimated for all salmonid species (*Oncorhynchus* spp.) and found to be more than 70% for yearling chinook salmon (*O. tshawytscha*) and steelhead (*O. mykiss*), but much lower (21%) for subyearling chinook salmon. In 1985, orifice passage efficiency (OPE) for all juvenile salmonids was greater than 70%. However, with the bypass system connected to only nine

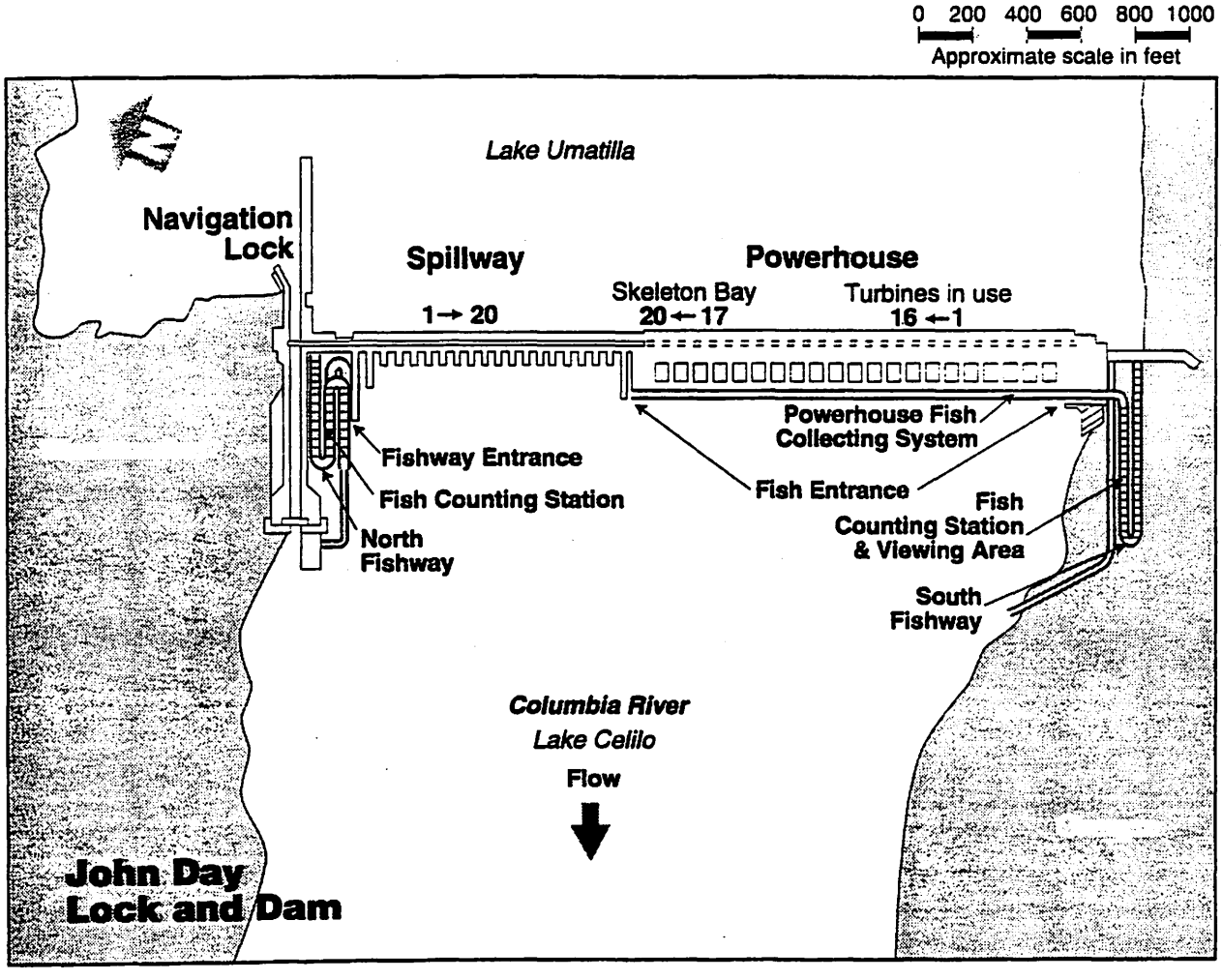

Figure 1. Overview of John Day Dam on the lower Columbia River showing numbering sequence of turbine units and spillbays.

turbine units, orifice head was 1.7 m (5.8 ft), considerably higher than the 1.1 m (3.7 ft) expected when the bypass system was connected to all sixteen turbine units. There was a distinct possibility that a reduction in orifice head could result in decreased OPE, but because the fish sampling facilities located on the transportation channel were incomplete in 1985, only preliminary evaluations were possible.

Prior to the 1986 smolt migration, the collection and bypass system for Turbine Units 10, 11, and 12 was completed. Numerous modifications had also been made to the temporary juvenile fish sampler and handling facilities. With a completed bypass in 12 units, orifice head was reduced to about 1.2 m (4 ft) (very close to the expected normal operating head of 1.1 m.).

In 1986, FGE tests were conducted with only subyearling chinook salmon and averaged 35%. This was higher than in 1985, but still considerably lower than target levels. Seasonal average OPE was 69 and 66% for yearling and subyearling chinook salmon, respectively. There were no significant differences in seasonal average OPE between the 1985 and 1986 seasons, despite the reduction in orifice head.

Encouraging results from tests with extended-length screens at McNary Dam in 1991, 1992, and 1993 (Brege et al. 1992; McComas et al. 1993, 1994) and at The Dalles Dam in 1993 and 1994 (Brege et al. 1994, Absolon et al. 1995) suggested that FGE for both yearling and subyearling chinook salmon at John Day Dam might be improved with longer screens.

In 1996, tests were conducted at John Day Dam to evaluate the FGE of an extended-length submersible bar screen (ESBS) used with an inlet flow vane and the effects of these guidance devices on descaling of juvenile salmonids. The ESBS was tested at a 55° angle

in conjunction with a reconfigured VBS, a beam extension, and a downstream fillet assembly (Fig. 2). In addition, the effects on OPE of enlarged orifices combined with the increased flows up into the gatewell produced by the ESBS were evaluated. Specific research objectives at John Day Dam in 1996 were the following:

1) Evaluate the fish guidance efficiency of an extended-length submersible bar screen and inlet flow vane.
2) Evaluate orifice passage efficiency with an extended-length submersible bar screen and inlet flow vane.
3) Evaluate the effects of an extended-length submersible bar screen and inlet flow vane on juvenile salmonid descaling.

Spring testing for the above objectives was conducted between 8 May and 1 June for the 1996 season. Summer testing was conducted between 24 June and 19 July.

OBJECTIVE 1: EVALUATE THE FISH GUIDANCE EFFICIENCY OF AN EXTENDED-LENGTH SUBMERSIBLE BAR SCREEN AND INLET FLOW VANE

Approach

The methods for determining FGE were similar to those used in previous FGE studies with extended-length screens (Brege et al. 1992, McComas et al. 1993). Gatewell dip-net catches provided estimates of the number of guided fish (Swan et al. 1979), while fyke-net catches provided estimates of the number of unguided fish (Fig. 2). Fish guidance efficiency for each species was calculated as gatewell catch (guided fish) divided by the total number of fish (guided plus unguided) passing through the turbine intake during the test period, as in the equation below:

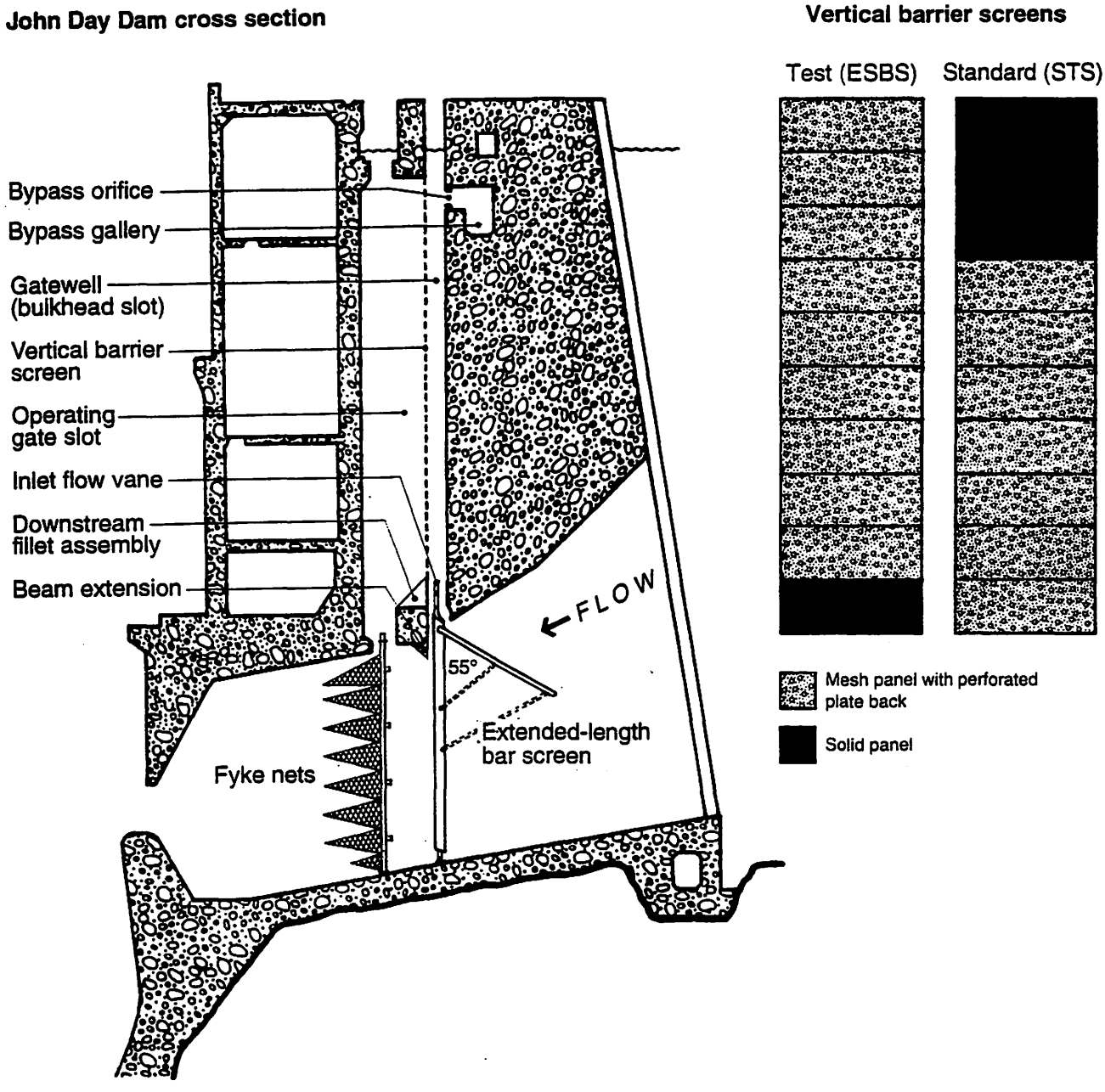

Figure 2. Cross section of turbine unit at John Day Dam with extended-length bar screen (ESBS) and inlet flow vane in place, and vertical barrier screen configurations used with ESBSs and standard-length submersible traveling screens (STSs).

$$FGE = \frac{GW}{GW+FN} \; X \; 100\%$$

$$GW = gatewell\ catch$$
$$FN = fyke\text{-}net\ catch$$

Guided fish were confined to the bulkhead slot by a vertical barrier screen (VBS) that separated the bulkhead slot from the operating gate slot (Fig. 2). Configurations for the VBSs used were modeled by the COE's Waterways Experiment Station (WES) prior to testing at the dam. The VBS designed for use with STSs (Unit 6) consisted of 10, 2.6-m-high panels, each of which extended across the full width of the slot. The front of each panel was covered with monofilament mesh and the back with either 20% open perforated steel plate to control flow or solid plate to block flow through the screen section. The VBS configuration for the slots with STSs consisted of seven 20% porosity panels at the bottom with three solid panels at the top (Fig. 2). The panel configuration for the VBSs in the test slots of Unit 7 was different from that for the VBSs in Unit 6 (and the rest of the powerhouse units) due to the higher flows generated by the ESBS and inlet flow vane. The VBS configuration for Unit 7 slots (all with ESBSs) consisted of one solid panel at the bottom, with nine 20% porosity panels extending to the top (Fig. 2).

Extended-length bar screens with inlet flow vanes similar to those tested during FGE tests in 1993 and 1994 at The Dalles Dam were used in the test slots (Brege et al. 1994, Absolon et al. 1995). Unit 7, the test unit, had ESBSs with 25% porosity perforated plate, while Unit 6 had STSs with 48% porosity perforated plate, the standard condition for STSs at John Day Dam.

Each FGE test lasted a minimum of 1 hour and typically began at 2000 h (dusk) and ended between 2100 and 2300 h, when it was estimated by gatewell dipnetting that the target number of fish (200 total) had been collected in the gatewell and fyke nets. Total numbers of fish collected were monitored by dipnetting the gatewells at 10 to 15 minute intervals during the test.

Past FGE studies have utilized fyke nets attached to a frame beneath the STS to collect unguided fish. With extended-length screens, this is not possible because the screen framework fills the entire bulkhead slot of the turbine intake (Fig. 2). Therefore, a frame with fyke nets was installed in the downstream gate slot to collect unguided fish. As at The Dalles Dam in 1993 and 1994, redesigned fyke-net frames, more streamlined than older styles, were used to reduce the effect of the frame on flow through the test unit. Newly designed fyke nets were also used to minimize water resistance and increase flow through the nets.

With extended-length screens, fyke nets were arranged in three columns (designated left, middle, right, as viewed from the downstream side) and eight levels (numbered from top to bottom) (Fig. 2). The smaller nets at Net-level 8 were approximately one-third the size of nets at other levels and caught very few fish (Appendix Table 1). The catch from Net-level 8 was added to that of Net-level 7 for comparisons, since most other studies cite seven net levels. Because the proportion of total fyke-net catch for each column cannot be reliably predicted with extended-length screens, cod ends were placed on all 24 fyke nets used in FGE tests with these screens. An analysis of fyke-net catch by net column with extended-length screens at McNary Dam is included in McComas et al. (1994).

Fish guidance efficiency tests with an ESBS were conducted in the center slot of Unit 7 during the spring and summer juvenile salmonid outmigrations. There were no FGE tests conducted with an STS at John Day Dam in 1996.

Results and Discussion

Yearling Fish

Testing for FGE began 8 May and ended 31 May, when fish numbers dropped at the end of the spring outmigration (Appendix Table 1). During the spring season we handled the following numbers of juvenile salmonids during FGE tests: 43 subyearling chinook salmon, 5,561 yearling chinook salmon, 2,458 steelhead, 1,379 coho salmon (*O. kisutch*), and 1,148 sockeye salmon (*O. nerka*), for a total of 10,589 fish.

Test Unit 7 and adjacent units were operated at 155 megawatts (MW) with an approximate discharge of 21,000 cubic feet per second (kcfs) during the test period. From 8 to 14 May, spill began at 1800 h and ended mid-morning, averaging about 50 kcfs, with total average river flows of 300 kcfs or less. Spill was continuous from 15 to 31 May, averaging about 100 kcfs and peaking at 170 kcfs on 30 May, with total average river flows of 400 kcfs or more, peaking at 455 kcfs on 31 May.

Mean FGEs (with 95% confidence intervals) for spring fish were as follows: yearling chinook salmon 84.0% (± 1.6), steelhead 94.1% (± 1.8), coho salmon 94.8% (± 2.6), and sockeye salmon 78.9% (± 3.8). Yearling chinook salmon FGE was comparable to FGEs of 78 and 80% obtained with extended-length screens at McNary Dam in 1991 and 1992 (Brege et al. 1992, McComas et al. 1993) and was higher than FGEs of 73 and 69% with ESBSs at The Dalles Dam in 1993 and 1994 (Brege et al. 1994, Absolon et al. 1995). The mean yearling chinook salmon FGE of 84% was also well above the FGE of 72%

estimated in 1985 using STSs with fyke nets deployed directly below the screens (Krcma et al. 1986).

FGE and percent catch by net level for yearling chinook salmon are shown in Figure 3. The largest catch was in Net-level 5 (6.3%), followed by Net-levels 4 and 6 which were similar. The leading edge of the ESBS intercepts flow at approximately the same elevation as the bottom of Net-level 4 (Fig. 2).

Subyearling Fish

Testing for FGE began 24 June and ended 19 July, when 20 replicates had been completed (Appendix Table 1). During the summer season, we handled the following numbers of juvenile salmonids during FGE tests: 5,904 subyearling chinook salmon, 93 yearling chinook salmon, 31 steelhead, 2 coho salmon, and 9 sockeye salmon, for a total of 6,039 fish.

Test Unit 7 and adjacent units were operated at 155 MW with an approximate discharge of 21 kcfs during the test period. Spill was continuous from 24 June to 1 July, averaging about 50 kcfs, with total average river flows of 300 kcfs or more. From 2 to 19 July, spill began at 1800 h and ended mid-morning, averaging about 50 kcfs, with total average river flows of 280 kcfs or less.

Mean FGE (with 95% confidence interval) for subyearling chinook salmon was 60.2% (± 6.3). This was comparable to extended-length screen FGEs of 64 and 53% at McNary Dam in 1991 and 1992 (Brege et al. 1992, McComas et al. 1993) and 59 and 54% at The Dalles Dam in 1993 and 1994 (Brege et al. 1994, Absolon et al. 1995). The mean subyearling chinook salmon FGE of 60% was well above the FGE of 35% estimated

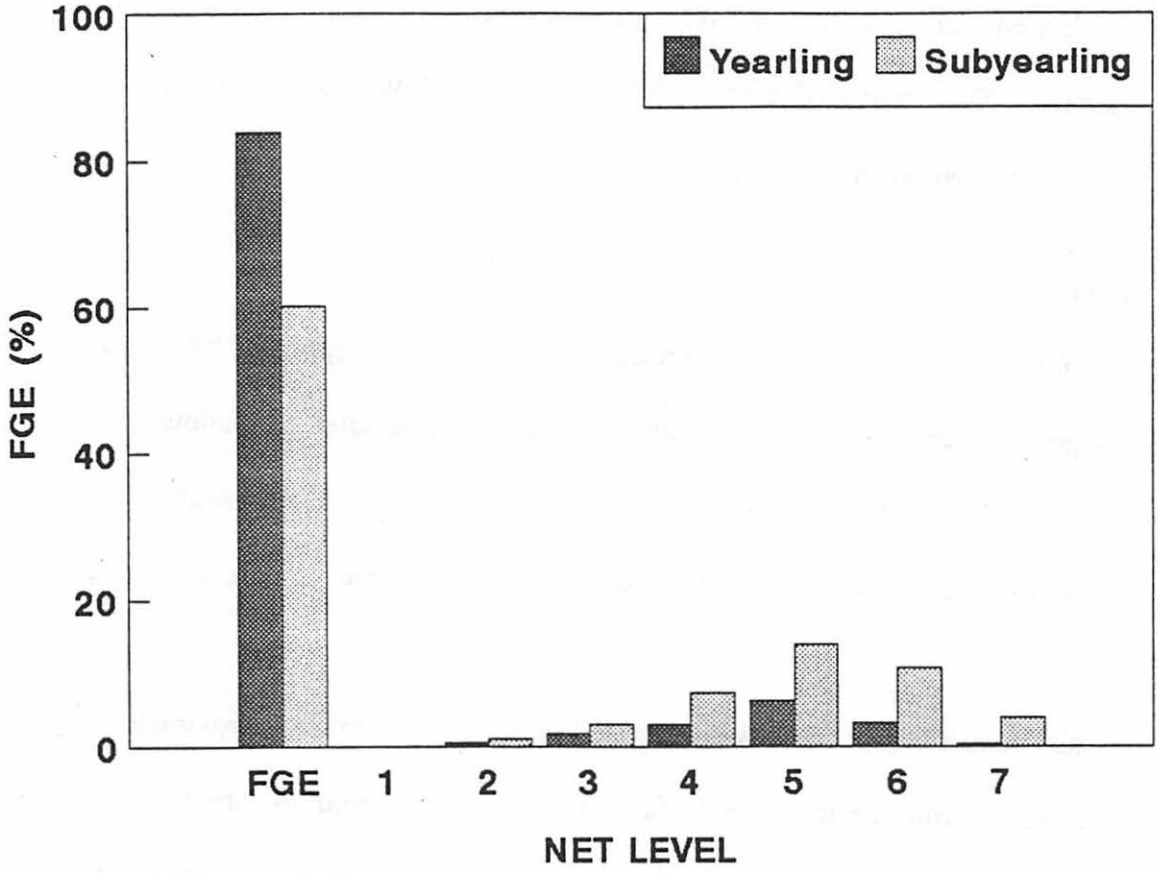

Figure 3. Yearling and subyearling chinook salmon seasonal fish guidance efficiency (FGE) and catch by net level at John Day Dam, 1996.

in 1986 using STSs (Brege et al. 1987). Other salmonid species were not present in large enough numbers for statistical evaluation.

FGE and percent catch by net level for subyearling chinook salmon are shown in Figure 3. The largest catch was in Net-level 5 (13.9%), followed by that in Net-level 6. This differed from the yearling chinook salmon results, in which the catch from Net-levels 4 and 6 were nearly the same. The larger percent net catches in the lower net levels for subyearling chinook salmon in summer indicated that these fish pass through the turbine units at greater depths than spring migrants.

OBJECTIVE 2: EVALUATE ORIFICE PASSAGE EFFICIENCY WITH AN EXTENDED-LENGTH SUBMERSIBLE BAR SCREEN AND INLET FLOW VANE

Approach

In 1994, the orifice inserts at John Day Dam were changed, increasing the orifice diameter from 30 to 35 cm (12 to 14 in). The orifices were located 1.1 m (3 ft 6 in) on center from the north end of the gate slot at elevation 76.4 m (250.5 ft). Normal operating pool for the reservoir is elevation 80.8 m (265.0 ft). Depending on the resulting drawdown of the gatewell surface due to turbine operation, submergence of the juvenile fish bypass orifices is about 4.3 m (14 ft), which is deeper than at other Columbia and Snake River dams. The head differential between the water level in the juvenile fish bypass conduit and that in the forebay was maintained at 1.4 m (4.5 ft). With a normal drawdown of the gatewell surface of 15 cm (0.5 ft) during turbine operation, the head differential between the gatewell and juvenile fish bypass channel is 1.2 m (4.0 ft).

An indirect method of determining OPE was used, which was similar to methods used in previous OPE studies with traveling screens at John Day Dam (Krcma et al. 1986, Brege et al. 1987). Test slots (6B, 7B) were dipnetted daily (prior to the start of a test to remove any residual fish) and the collected fish anesthetized with tricaine methanesulfonate (MS-222) and examined. From the collected fish, 100 juvenile salmonids per OPE replicate were caudal-fin clipped and held in the release canister for 1 hour to monitor short-term mortality. Obviously injured fish were the only fish not included in the marked group. Marked fish were released in the center of the test gatewells, 9.1 m (30 ft) below the surface and allowed to exit the gatewells through the juvenile fish bypass orifice.

At a specified time each test day, all fish were dipnetted from the gatewells (Swan et al. 1979). A typical OPE test lasted 19 hours, beginning at 2300 h and ending at 1800 h the next day. Turbine Unit 6 was operated continuously during the spring and summer test periods. Turbine Unit 7 was operated from 2300 h until 1800 h the next day for OPE tests, shut down from 1800 to 2000 h to lower the fyke-net frame into place, run from 2000 to 2130 h for the FGE test, shut down to raise the fyke-net frame and remove the catch, and started up again about 2300 h for the OPE test. Since OPE tests were being conducted in the same slot as the FGE tests, OPE tests could not begin until FGE tests and associated short-term descaling tests in Slot 6B had concluded for the day.

The gatewell dipnetting technique for OPE relies on the assumptions that fish survive the marking process in good condition, exit the gatewell via the bypass orifice, and that all of the fish remaining in the gatewell are captured by the dip net. Orifice passage efficiency was calculated as the number of clipped fish that exited the gatewell divided by the total number released.

To evaluate the validity of these assumptions, gatewell efficiency/marked fish mortality tests were conducted periodically throughout the spring and summer outmigrations. During these tests, fish were marked, held for 1 hour to monitor short-term mortality, and then placed in the gatewell with the orifice closed. At the end of the test period, the gatewell was dipnetted and the catch examined and enumerated. Recapture efficiency was calculated as the number of marked fish recaptured divided by the total number of marked fish released.

The test design provided for 20 OPE measurements in each of the two test slots during both the spring and summer juvenile salmonid outmigrations.

Results and Discussion

Yearling Fish

Testing for OPE began 11 May and ended 1 June when fish numbers dropped at the end of the spring outmigration (Appendix Table 1). During the spring season, we handled the following numbers of juvenile salmonids during OPE tests: 97 subyearling chinook salmon, 4,687 yearling chinook salmon, 15,768 steelhead, 657 coho salmon, and 637 sockeye salmon, for a total of 21,846 fish. We marked and released 3,588 yearling chinook salmon (included in the above count) during our spring OPE tests.

Mean OPEs for yearling chinook salmon with the ESBS (Slot 7B) and the STS (Slot 6B) were 98.7 and 80.5%, respectively. Daily OPE was consistently higher in the ESBS slot than in the STS slot (Fig. 4). The difference in OPE between the ESBS and

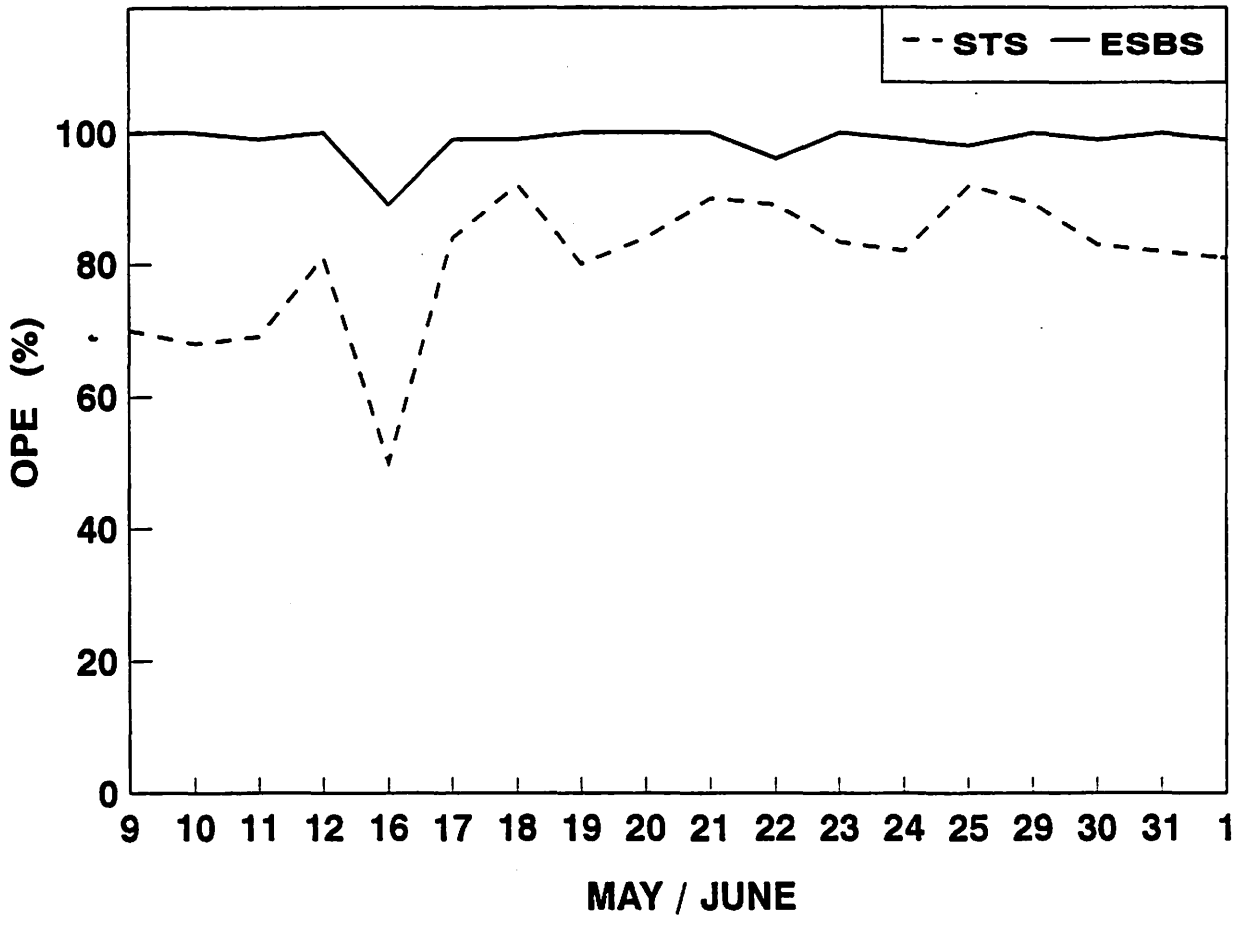

Figure 4. Daily orifice passage efficiency (OPE) for yearling chinook salmon at John Day Dam, 1996.

STS slots was 18.2% (± 5.0), a statistically significant difference ($P < 0.05$). These OPE results with ESBSs compare favorably with 1995 yearling chinook salmon OPEs of 79 and 78% for north and south orifices, respectively, at McNary Dam and 80 and 68% for west and east orifices, respectively, at The Dalles Dam. Results at both dams were obtained with ESBSs and the same mark/recapture method used in the present study (McComas et al. 1997, Brege et al. 1997). A mean yearling chinook salmon OPE of 72% was recorded in 1985 at John Day Dam with STSs (Krcma et al. 1986).

A recapture efficiency/mortality test conducted 1 June in Slot 6B with yearling chinook salmon resulted in a recapture efficiency of 100%. There was no descaling or mortality due to handling.

Subyearling Fish

Testing for OPE began 24 June and ended 15 July when fish numbers dropped at the end of the summer outmigration (Appendix Table 1). During the summer season, we handled the following numbers of juvenile salmonids during OPE tests: 9,614 subyearling chinook salmon, 39 yearling chinook salmon, 36 steelhead, 1 coho salmon, and 24 sockeye salmon, for a total of 9,714 fish. We marked and released 2,770 subyearling chinook salmon (included in the above count) during our summer OPE tests. Subyearling chinook salmon made up 99% of the summer catch.

Mean OPEs for subyearling chinook salmon with the ESBS (Slot 7B) and the STS (Slot 6B) were 97.1 and 97.5%, respectively. Throughout the test period, daily OPE with the ESBS and STS was nearly identical (Fig. 5). The difference in OPE between the ESBS and the STS was -0.4% (± 2.6), not a statistically significant difference. These results are

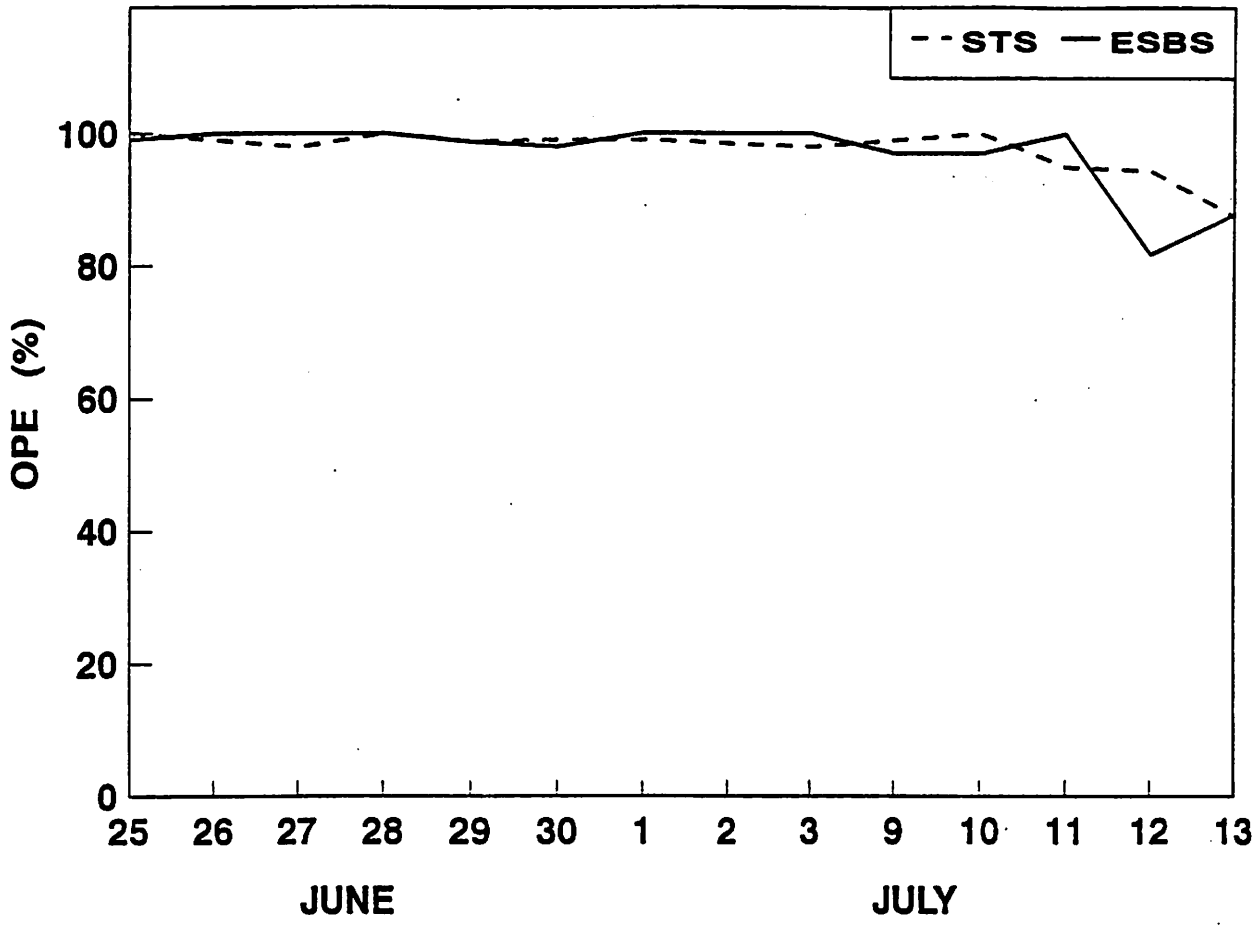

Figure 5. Daily orifice passage efficiency (OPE) for subyearling chinook salmon at John Day Dam, 1996.

comparable to 1995 subyearling chinook salmon OPEs of 95 and 99% for north and south orifices, respectively, at McNary Dam, but were somewhat higher than OPEs of 86 and 63% for west and east orifices, respectively, at The Dalles Dam. Again, these studies used ESBSs and the same mark/recapture method (McComas et al. 1997, Brege et al. 1997).

A recapture efficiency/mortality test conducted 3 July in Slot 7B with subyearling chinook salmon resulted in a recapture efficiency of 99%. There was no descaling or mortality due to handling.

OBJECTIVE 3: EVALUATE THE EFFECTS OF AN EXTENDED-LENGTH SUBMERSIBLE BAR SCREEN AND INLET FLOW VANE ON JUVENILE SALMONID DESCALING

Approach

The condition of fish captured during FGE and OPE tests was monitored using standard Fish Transportation Oversight Team descaling criteria (Ceballos et al. 1993) with the following exception. Only freshly descaled fish were designated descaled; if scale regeneration had begun or fungal growth was present, the fish was not classified as descaled. The objective was to determine whether the test conditions were adversely impacting fish condition, so fish with injuries that had obviously occurred at some time prior to the test were not included. Fish with bird marks were not considered descaled. Head injuries, such as folded operculums and eye injuries, were recorded. To ensure that evaluations of descaling were as consistent as possible, the same individuals examined the fish throughout the study period.

Descaling of fish collected from Slot 6B (containing an STS) was compared to descaling of fish collected during FGE tests in Slot 7B (containing an ESBS) during the

same time period. The test slots were dipnetted daily between 1730 and 1800 h. Captured fish were anesthetized with MS-222, identified by species, examined, and enumerated.

Results and Discussion

Yearling Fish

Descaling was low for yearling chinook salmon captured during FGE and OPE tests (Table 1). In addition, head injuries (damage to the operculum, gills, or eye), body injuries due to bird bites, and external fungal infections were uncommon. Low descaling rates precluded the need for statistical analysis. Detailed descaling data are summarized in Appendix Table 2.

No descaling of marked fish occurred during the time fish were confined to the gate slot in recapture efficiency/mortality tests.

Table 1. Descaling test results for yearling chinook salmon at John Day Dam, 1996 (ESBS = extended-length submersible bar screen, STS = standard-length submersible traveling screen). Mean descaling and total catch are combined results of fish collected during fish guidance efficiency tests.

	Slot 6B	Slot 7B
Screen type	STS	ESBS
Porosity of perf. plate (%)	48	25
Mean descaling (%)	0.8	0.4
Total catch	2,390	4,694

Subyearling Fish

Descaling was also low for subyearling chinook salmon captured during FGE and OPE tests (Table 2). As with yearling fish, head injuries, body injuries due to bird bites,

and external fungal infections were uncommon. Low descaling rates precluded the need for statistical analysis. Detailed descaling data are summarized in Appendix Table 2.

No descaling of marked fish occurred during the time fish were confined to the gate slot in recapture efficiency/mortality tests.

Table 2. Descaling test results for subyearling chinook salmon at John Day Dam, 1996 (ESBS = extended-length submersible bar screen, STS = standard-length submersible traveling screen). Mean descaling and total catch are combined results of fish collected during fish guidance efficiency tests.

	Slot 6B	Slot 7B
Screen type	STS	ESBS
Porosity of perf. plate (%)	48	25
Mean descaling (%)	1.2	0.4
Total catch	1,290	3,067

SUMMARY

1) With an ESBS and inlet flow vane, mean FGEs for yearling and subyearling chinook salmon were 84.0% (± 1.6) and 60.2% (± 6.3), respectively.
2) Mean OPEs for yearling chinook salmon with the ESBS and STS were 98.7 and 80.5%, respectively. The difference, 18.2% (± 5.0), was statistically significant.
3) Mean OPEs for subyearling chinook salmon with the ESBS and the STS were 97.1 and 97.5%, respectively. The difference, -0.4% (± 2.6), was not statistically significant.
4) Descaling rates were low for both yearling chinook salmon during the spring outmigration (<1%) and subyearling chinook salmon during the summer outmigration (<1.5%).

ACKNOWLEDGMENTS

We express our appreciation to our seasonal personnel for their enthusiasm and efforts during this study. We extend special thanks to the Portland District COE personnel, particularly Mr. John Ferguson and Mr. Robert Dach at the district office and Mr. Donald Kumm, Screen Crew Foreman, and Miroslaw Zyndol, Project Biologist, at John Day Dam, for their assistance and cooperation in this study. We also extend special thanks to Mr. Wallace Iceberg and Mr. Irvin Wilbert of our maintenance staff for their innovative ideas and efforts in the completion of this study.

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APPENDIX TABLES

Appendix Table 1. Numbers of fish caught, by species, and fyke-net catch distribution for individual replicates of fish guidance efficiency (FGE) tests at John Day Dam, 1996.

8 May

Location	Subyearling chinook				Yearling chinook				Steelhead				Coho				Sockeye			
	L	M	R	Tot[1]	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot
Level 1																				
Level 2		1		1		2		2									1			1
Level 3					1	2	2	5	1			1			1	1				
Level 4					1	1	2	4					1			1	1		1	2
Level 5					9	9	5	23	1			1	1	1		2	1	1		2
Level 6					3	1	2	6					1			1	1	2		3
Level 7					1	1	1	3					1			1				
Level 8																				
Net total				1				43				2				6				8
Gatewell								169				74				90				44
Total				1				212				76				96				52
FGE								80				97				94				85

9 May

Location	Subyearling chinook				Yearling chinook				Steelhead				Coho				Sockeye			
	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot
Level 1																				
Level 2					2	1		3					1			1	1			1
Level 3						2	1	3											2	2
Level 4					1	7	1	9							1	1	1	1	1	3
Level 5					9	2	9	20	2			2		2		2		1	1	2
Level 6					1	2	4	7						2		2	1	2	1	4
Level 7																				
Level 8																				
Net total								42				2				6				12
Gatewell				1				152				78				64				31
Total				1				194				80				70				43
FGE				100				78				98				91				72

10 May

Location	Subyearling chinook				Yearling chinook				Steelhead				Coho				Sockeye			
	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot
Level 1																				
Level 2						1		1		1		1								
Level 3						3	4	7							1	1	2			2
Level 4					1	3	1	5			1	1					1		1	2
Level 5					8	5	7	20					1			1	1		1	2
Level 6					6	5	5	16										1		1
Level 7																				
Level 8					1			1											1	1
Net total								50				2				2				8
Gatewell								179				48				31				33
Total								229				50				33				41
FGE								78				96				94				81

[1] L = left, M = middle, and R = right fyke-net column; Tot = total catch for net level.

Appendix Table 1. Continued.

11 May

Location	Subyearling chinook				Yearling chinook				Steelhead				Coho				Sockeye			
	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot
Level 1																				
Level 2										1		1								
Level 3					5	2	4	11			2	2			2	2			2	2
Level 4					7	3	7	17		1		1	1			1				
Level 5					9	9	10	28	2		1	3	2	1	2	5	2			2
Level 6					6	10	3	19					2	2		4	1			1
Level 7					1			1					1			1				
Level 8																				
Net total								76				7				13				5
Gatewell								456				247				54				37
Total								532				254				67				42
FGE								86				97				81				88

12 May

Location	Subyearling chinook				Yearling chinook				Steelhead				Coho				Sockeye			
	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot
Level 1																	1			1
Level 2						1	3	4												
Level 3						1	2	3							2	2	1		1	2
Level 4					2	2	9	13		1	1	2					1			1
Level 5					13	4	5	22	1			1	1		2	3	1		1	2
Level 6					2	6	4	12	1			1					1	1		2
Level 7					1			1									1		3	4
Level 8					2			2												
Net total								57				4				5				12
Gatewell				1				250				59				164				28
Total				1				307				63				169				40
FGE				100				81				94				97				70

15 May

Location	Subyearling chinook				Yearling chinook				Steelhead				Coho				Sockeye			
	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot
Level 1																				
Level 2					2	1	2	5							1	1	2		1	3
Level 3					3	2	4	9												
Level 4					5	1	7	13							3	3	1	1	1	3
Level 5					7	4	4	15	1			1	1	2	1	4	1	1	2	4
Level 6					4	3	4	11	1			1	1			1	2	1	1	4
Level 7					1	1		2						1		1		1	1	2
Level 8																				
Net total								55				2				10				16
Gatewell								292				43				142				46
Total								347				45				452				62
FGE								84				96				93				74

Appendix Table 1. Continued.

16 May

Location	Subyearling chinook				Yearling chinook				Steelhead				Coho				Sockeye			
	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot
Level 1																				
Level 2						1		1												
Level 3					1		1	2												
Level 4					1	2		3									1		1	2
Level 5					2	2	2	6	1			1					1		2	3
Level 6					2	5	2	9										1		1
Level 7													1			1				
Level 8																				
Net total								21				1				1				6
Gatewell								76				42				40				33
Total								97				43				41				39
FGE								78				98				98				85

17 May

Location	Subyearling chinook				Yearling chinook				Steelhead				Coho				Sockeye			
	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot
Level 1																				
Level 2											1	1								
Level 3						1	2	3			1	1			1	1		2	2	4
Level 4					4	2	2	8		1		1					1	2	1	4
Level 5					2	5	2	9			1	1			1	1		2	1	3
Level 6					3	1	3	7									2	1	2	5
Level 7																		1		1
Level 8																				
Net total								27				4				2				17
Gatewell								135				114				70				36
Total								162				118				72				53
FGE								83				97				97				68

18 May

Location	Subyearling chinook				Yearling chinook				Steelhead				Coho				Sockeye			
	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot
Level 1															1	1				
Level 2					1		1	2										1		1
Level 3					1		2	3			1	1		1		1				
Level 4					1	1	7	9	1		3	4					3			3
Level 5					3	5	5	13			3	3		1		1		1	1	2
Level 6					4	2		6	1		1	2	1	1		2	1	1	1	3
Level 7						1	1	2							2	2	1			1
Level 8																		1		1
Net total								35				10				7				11
Gatewell								187				226				66				23
Total								222				236				73				34
FGE								84				96				90				68

Appendix Table 1. Continued.

19 May

Location	Subyearling chinook				Yearling chinook				Steelhead				Coho				Sockeye			
	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot
Level 1					1			1												
Level 2						1	2	3			1	1							1	1
Level 3					1	1	5	7		1	1	2		1	1	2	3	3	2	8
Level 4					6	2	5	13							2	2	3			3
Level 5					15	7	9	31									1	2	2	5
Level 6					6	4	1	11	1	1	1	3	2			2		1	1	2
Level 7																	1			1
Level 8							1	1												
Net total								67				6				6				20
Gatewell				1				353				183				159				94
Total				1				420				189				165				114
FGE				100				84				97				96				83

20 May

Location	Subyearling chinook				Yearling chinook				Steelhead				Coho				Sockeye			
	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot
Level 1																				
Level 2						2	1	3							1	1	2			2
Level 3					1		5	6		1	1	2						1	2	3
Level 4					3	3	5	11	2		1	3	1	2	1	4	3	2	2	7
Level 5					10	9	7	26	1			1			1	1	1	1	2	4
Level 6					6	3	4	13		3	3	6							2	2
Level 7					1	1		2			1	1								
Level 8																				
Net total								61				13				6				18
Gatewell								405				176				247				75
Total								466				189				253				93
FGE								87				93				98				81

21 May

Location	Subyearling chinook				Yearling chinook				Steelhead				Coho				Sockeye			
	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot
Level 1																				
Level 2					2			2	1	2	1	4					1	1		2
Level 3						2	4	6	1		4	5					1	1	1	3
Level 4					3	1	5	9	1	3	5	9						1	1	2
Level 5					3	4	6	13	3			3	1	1		2	2			2
Level 6					1	3	4	8	4	3		7						1	1	2
Level 7											1	1								
Level 8																				
Net total								38				29				2				11
Gatewell				2				210				377				48				53
Total				2				248				406				50				64
FGE				100				85				93				96				83

Appendix Table 1. Continued.

22 May

Location	Subyearling chinook				Yearling chinook				Steelhead				Coho				Sockeye			
	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot
Level 1																				
Level 2					1	1		2		1	1	2					1	1		2
Level 3					3	3	1	7	1	2	2	5							1	1
Level 4					3	5	9	17		1	1	2					1	2	1	4
Level 5					11	9	5	25			1	1					1	2	2	5
Level 6					3	9	7	19	1	1	1	3					2	1		3
Level 7										2	1	3						1	1	2
Level 8																				
Net total								70				16								17
Gatewell				1				372				194				38				94
Total				1				442				210				38				111
FGE				100				84				92				100				85

23 May

Location	Subyearling chinook				Yearling chinook				Steelhead				Coho				Sockeye			
	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot
Level 1																				
Level 2																		1		1
Level 3	1			1			3	3		1		1					2	2	2	6
Level 4					2	1	2	5	2	1	3	6						2		2
Level 5					3	6	4	13	1	1		2					1		1	2
Level 6					1	1	2	4	1	4		5						2		2
Level 7	1			1						1		1						1		1
Level 8																				
Net total				2				25				15								14
Gatewell				1				162				121				10				106
Total				3				187				136				10				120
FGE				33				87				89				100				88

24 May

Location	Subyearling chinook				Yearling chinook				Steelhead				Coho				Sockeye			
	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot
Level 1									1			1								
Level 2					1			1									1			1
Level 3					1	1	1	3			2	2					1			1
Level 4					2	2	4	8		1	1	2					1		1	2
Level 5					2	6	3	11	1		2	3					1	1	3	5
Level 6					2		3	5	1			1	1			1	1		1	2
Level 7																				
Level 8					1			1												
Net total								29				9				1				11
Gatewell								232				86				29				69
Total								261				95				30				80
FGE								89				91				97				86

Appendix Table 1. Continued.

25 May

Location	Subyearling chinook				Yearling chinook				Steelhead				Coho				Sockeye			
	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot
Level 1					1			1												
Level 2						1	1	2									1			1
Level 3					4		5	9		1		1					1		1	2
Level 4					3	1	3	7											1	1
Level 5					11	7	10	28		1		1					2	2		4
Level 6					4	6	1	11									1	1	1	3
Level 7					1	1		2										1		1
Level 8																				
Net total								60				2								12
Gatewell				2				314				97				30				64
Total				2				374				99				30				76
FGE				100				84				98				100				84

28 May

Location	Subyearling chinook				Yearling chinook				Steelhead				Coho				Sockeye			
	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot
Level 1																				
Level 2							1	1												
Level 3		1		1			1	1			1	1							1	1
Level 4						3	2	5		1		1			1	1		1	1	2
Level 5		1		1	2	3	3	8	1			1					1			1
Level 6					1	4		5			1	1					1			1
Level 7							1	1												
Level 8																				
Net total				2				21				4				1				5
Gatewell				2				177				51				6				15
Total				4				198				55				7				20
FGE				50				89				93				86				75

29 May

Location	Subyearling chinook				Yearling chinook				Steelhead				Coho				Sockeye			
	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot
Level 1																				
Level 2																				
Level 3		1		1	2	2	1	5			1	1								
Level 4					2	4	4	10			1	1					1			1
Level 5		1		1	7	6	2	15	1	3	2	6					1	1	2	4
Level 6					2	3	1	6									4			4
Level 7			1	1	1	2		3												
Level 8														1		1				
Net total				3				39				8				1				9
Gatewell				8				244				45				10				14
Total				11				283				53				11				23
FGE				73				86				85				91				61

Appendix Table 1. Continued.

30 May

Location	Subyearling chinook				Yearling chinook				Steelhead				Coho				Sockeye			
	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot
Level 1																				
Level 2						1	1	2												
Level 3					1		2	3												
Level 4			1	1		1	2	3	1			1							1	1
Level 5					2	3	4	9			2	2								
Level 6			1	1	1	2		3	1			1					1		1	2
Level 7					1		1	2		1	1	2								
Level 8																				
Net total				2				22				6								3
Gatewell				6				113				22				2				19
Total				8				135				28				2				22
FGE				75				84				79				100				86

31 May

Location	Subyearling chinook				Yearling chinook				Steelhead				Coho				Sockeye			
	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot
Level 1																				
Level 2																	1			1
Level 3							3	3										1		1
Level 4	1			1	1	2	2	5										3		3
Level 5		1	1	2	4	6	3	13									1	1		2
Level 6					3	2	2	7										1		1
Level 7							1	1												
Level 8																				
Net total				3				29												8
Gatewell				5				216				33				10				11
Total				8				245				33				10				19
FGE				63				88				100				100				58

Appendix Table 1. Continued.

24 June

Location	Subyearling chinook				Yearling chinook				Steelhead				Coho				Sockeye			
	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot
Level 1																				
Level 2	2			2						1		1								
Level 3	1	3	4	8																
Level 4	2	3	6	11																
Level 5	6	3	2	11	1			1												
Level 6	5	9	2	16		1		1												
Level 7		1	1	2																
Level 8	1			1																
Net total				51				2				1								
Gatewell				151				9				4				1				2
Total				202				11				5				1				2
FGE				75				82				80				100				100

25 June

Location	Subyearling chinook				Yearling chinook				Steelhead				Coho				Sockeye			
	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot
Level 1																				
Level 2	2	2		4																
Level 3	2	2	5	9																
Level 4	9	4	5	18																
Level 5	8	7	11	26		1		1												
Level 6	5	3	6	14																
Level 7	2	3	2	7																
Level 8																				
Net total				78				1												
Gatewell				167				7												
Total				245				8												
FGE				68				88												

26 June

Location	Subyearling chinook				Yearling chinook				Steelhead				Coho				Sockeye			
	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot
Level 1																				
Level 2	6		3	9																
Level 3	3	2	4	9																
Level 4	1	3	4	8																
Level 5	10	5	7	22																
Level 6	1	7	4	12																
Level 7	2			2																
Level 8																				
Net total				62																
Gatewell				298				2								1				
Total				360				2								1				
FGE				83				100								100				

Appendix Table 1. Continued.

27 June

Location	Subyearling chinook				Yearling chinook				Steelhead				Coho				Sockeye			
	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot
Level 1																				
Level 2	1		2	3																
Level 3	2	7	2	11	1			1												
Level 4	9	3	4	16																
Level 5	12	8	14	34	2	1		3												
Level 6	9	10	7	26																
Level 7	1	3	4	8																
Level 8		1	2	3																
Net total				101				4												
Gatewell				119				6				1								
Total				220				10				1								
FGE				54				60				100								

28 June

Location	Subyearling chinook				Yearling chinook				Steelhead				Coho				Sockeye			
	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot
Level 1																				
Level 2	1	2		3																
Level 3	1		6	7																
Level 4	4	7	3	14																
Level 5	3	5	14	22	2	1		3		1		1								
Level 6	11	9	6	26		1	1	2												
Level 7	2	2		4																
Level 8			2	2																
Net total				78				5				1								
Gatewell				162				8				3								1
Total				240				13				4								1
FGE				68				62				75								100

29 June

Location	Subyearling chinook				Yearling chinook				Steelhead				Coho				Sockeye			
	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot
Level 1																				
Level 2	5	2	1	8																
Level 3	3	1	7	11							1	1								
Level 4	9	4	12	25	1			1												
Level 5	19	12	9	40	1			1												
Level 6	11	4	4	19																
Level 7	4	1	2	7																
Level 8																				
Net total				110				2				1								
Gatewell				421				5				2								1
Total				531				7				3								1
FGE				79				71				67								100

Appendix Table 1. Continued.

30 June

Location	Subyearling chinook				Yearling chinook				Steelhead				Coho				Sockeye			
	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot
Level 1																				
Level 2																				
Level 3		3	1	4																
Level 4	2	4	4	10																
Level 5	9	5	9	23			1	1												
Level 6	3	6	3	12		2		2												
Level 7	2	3		5																
Level 8																				
Net total				54				3												
Gatewell				80				4				2								
Total				134				7				2								
FGE				60				57				100								

1 July

Location	Subyearling chinook				Yearling chinook				Steelhead				Coho				Sockeye			
	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot
Level 1																				
Level 2																				
Level 3	8		3	11																
Level 4	6	3	3	12		2		2												
Level 5	13	10	9	32																
Level 6	9	7	7	23		2		2												
Level 7	2	3		5																
Level 8			1	1																
Net total				84				4												
Gatewell				115				1				5								
Total				199				5				5								
FGE				58				20				100								

2 July

Location	Subyearling chinook				Yearling chinook				Steelhead				Coho				Sockeye			
	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot
Level 1																				
Level 2		1		1																
Level 3	1	2	3	6																
Level 4	6	7	5	18																
Level 5	7	10	12	29																
Level 6	4	4	6	14			1	1												
Level 7		1	2	3																
Level 8			2	2																
Net total				73				1												
Gatewell				107				1				3								
Total				180				2				3								
FGE				59				50				100								

Appendix Table 1. Continued.

3 July

Location	Subyearling chinook				Yearling chinook				Steelhead				Coho				Sockeye			
	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot
Level 1																				
Level 2	1	2	3	6																
Level 3	5	4	6	15																
Level 4	11	10	9	30																
Level 5	20	28	13	61	1			1												
Level 6	19	27	20	66																
Level 7	8	6	12	26																
Level 8	2	4	2	8																
Net total				212				1												
Gatewell				217				1				1								
Total				429				2				1								
FGE				51				50				100								

8 July

Location	Subyearling chinook				Yearling chinook				Steelhead				Coho				Sockeye			
	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot
Level 1																				
Level 2			1	1																
Level 3	1	4	3	8	1			1												
Level 4	9	13	15	37	1	1		2												
Level 5	28	27	24	79	1	2	2	5												
Level 6	20	23	26	69	1	1	2	4												
Level 7	7	9	5	21			1	1												
Level 8																				
Net total				215				13												
Gatewell				183								2								
Total				398				13				2								
FGE				46								100								

9 July

Location	Subyearling chinook				Yearling chinook				Steelhead				Coho				Sockeye			
	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot
Level 1																				
Level 2	6			6																
Level 3	3	5	9	17																
Level 4	9	7	13	29			1	1												
Level 5	22	24	25	71																
Level 6	29	21	22	72			1	1												
Level 7	8	14	9	31																
Level 8	4		2	6																
Net total				232				2												
Gatewell				146				3				1								
Total				378				5				1								
FGE				39				60				100								

Appendix Table 1. Continued.

10 July

Location	Subyearling chinook				Yearling chinook				Steelhead				Coho				Sockeye			
	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot
Level 1																				
Level 2	2			2																
Level 3	2	4	2	8		1		1												
Level 4	3		3	6																
Level 5	6	11	2	19																
Level 6	4	5	5	14																
Level 7	1	1	1	3		1		1												
Level 8																				
Net total				52				2												
Gatewell				160																
Total				212				2												
FGE				76																

11 July

Location	Subyearling chinook				Yearling chinook				Steelhead				Coho				Sockeye			
	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot
Level 1	1			1																
Level 2	3	2		5																
Level 3	2	3	6	11																
Level 4	8	6	7	21																
Level 5	17	10	7	34																
Level 6	5	12	10	27																
Level 7	1	4		5																
Level 8																				
Net total				104																
Gatewell				182																
Total				286																
FGE				64																

12 July

Location	Subyearling chinook				Yearling chinook				Steelhead				Coho				Sockeye			
	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot
Level 1																				
Level 2			2	2																
Level 3	2	4	4	10																
Level 4	6	3	7	16																
Level 5	7	8	8	23	2			2												
Level 6	9	7	1	17																
Level 7	4		1	5																
Level 8		1		1																
Net total				74				2												
Gatewell				216																1
Total				290				2												1
FGE				75																100

Appendix Table 1. Continued.

15 July

Location	Subyearling chinook				Yearling chinook				Steelhead				Coho				Sockeye			
	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot
Level 1																				
Level 2			3	3																
Level 3	1	3	1	5																
Level 4	5	12	10	27																
Level 5	20	13	15	48																
Level 6	14	13	19	46	1			1												
Level 7	5	4	4	13																
Level 8		2	1	3																
Net total				145				1												
Gatewell				79								2								2
Total				224				1				2								2
FGE				35																100

16 July

Location	Subyearling chinook				Yearling chinook				Steelhead				Coho				Sockeye			
	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot
Level 1																				
Level 2	1			1																
Level 3	1	5	2	8																
Level 4	8	7	10	25																
Level 5	14	14	15	43	1			1												
Level 6	7	8	4	19																
Level 7	4	6	1	11																
Level 8																				
Net total				107				1												
Gatewell				135								1								1
Total				242				1				1								1
FGE				56								100								100

17 July

Location	Subyearling chinook				Yearling chinook				Steelhead				Coho				Sockeye			
	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot
Level 1																				
Level 2	4	1	3	8																
Level 3	7	3	5	15																
Level 4	28	22	22	72																
Level 5	43	45	43	131																
Level 6	24	35	26	85																
Level 7	8	11	7	26			1	1												
Level 8	1	1		2																
Net total				339				1												
Gatewell				331								1								
Total				670				1				1								
FGE				49								100								

Appendix Table 1. Continued.

18 July

Location	Subyearling chinook				Yearling chinook				Steelhead				Coho				Sockeye			
	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot
Level 1																				
Level 2																				
Level 3	2	1	2	5	1			1												
Level 4	5	12	9	26																
Level 5	16	17	14	47																
Level 6	8	18	8	34																
Level 7	5	5	1	11																
Level 8		2		2																
Net total				125				1												
Gatewell				127																
Total				252				1												
FGE				50																

19 July

Location	Subyearling chinook				Yearling chinook				Steelhead				Coho				Sockeye			
	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot
Level 1																				
Level 2																				
Level 3	2	3	2	7																
Level 4	5	4	8	17																
Level 5	9	9	10	28																
Level 6	7	7	11	25																
Level 7	2	4	1	7																
Level 8			1	1																
Net total				85																
Gatewell				127																1
Total				212																1
FGE				60																100

Appendix Table 2. Descaling data from fish guidance efficiency (FGE), orifice passage efficiency (OPE), and short-term descaling tests at John Day Dam, 1996.

Unit 7, Slot B (FGE)

Test date	Subyearling chinook			Yearling chinook			Steelhead			Coho			Sockeye		
	Desc.	Catch	%	Desc.	Catch	%	Desc.	Catch	%	Desc.	Catch	%	Desc.	Catch	%
8 May				2	169	1.2	1	74	1.4	1	90	1.1		44	0.0
9 May		1	0.0	1	152	0.7		78	0.0		64	0.0		31	0.0
10 May				1	179	0.6	1	48	2.1	1	31	3.2		33	0.0
11 May				3	456	0.7		247	0.0	5	54	9.3	1	37	2.7
12 May		1	0.0		250	0.0		59	0.0		164	0.0		28	0.0
15 May				1	292	0.3		43	0.0		142	0.0		46	0.0
16 May				1	76	1.3		42	0.0		40	0.0	1	33	3.0
17 May					135	0.0		114	0.0		70	0.0		36	0.0
18 May				1	187	0.5		226	0.0		66	0.0		23	0.0
19 May		1	0.0		353	0.0		183	0.0		159	0.0		94	0.0
20 May				1	405	0.2		176	0.0		247	0.0	2	75	2.7
21 May		2	0.0		210	0.0		377	0.0		48	0.0	2	53	3.8
22 May		1	0.0		372	0.0		194	0.0		38	0.0		94	0.0
23 May		1	0.0		162	0.0		121	0.0		10	0.0	1	106	0.9
24 May					232	0.0		86	0.0		29	0.0		69	0.0
25 May		2	0.0	3	314	1.0		97	0.0		30	0.0	2	64	3.1
28 May		2	0.0		177	0.0		51	0.0		6	0.0		15	0.0
29 May		8	0.0		244	0.0		45	0.0		10	0.0		14	0.0
30 May		6	0.0	3	113	2.7		22	0.0		2	0.0	1	19	5.3
31 May		5	0.0		216	0.0		33	0.0		10	0.0		11	0.0
24 June	1	151	0.7		9	0.0		4	0.0		1	0.0		2	0.0
25 June		167	0.0		7	0.0									
26 June	2	298	0.7		2	0.0					1	0.0			
27 June		119	0.0		6	0.0		1	0.0						
28 June	1	162	0.6		8	0.0		3	0.0					1	0.0
29 June		421	0.0		5	0.0		2	0.0						
30 June		80	0.0		4	0.0		2	0.0						
1 July		115	0.0		1	0.0		5	0.0						
2 July		107	0.0		1	0.0		3	0.0						
3 July		217	0.0		1	0.0		1	0.0						
8 July	2	183	1.1					2	0.0						
9 July	1	146	0.7	1	3	33.3		1	0.0						
10 July		160	0.0												
11 July	3	182	1.6												
12 July	2	216	0.9											1	0.0
15 July	1	79	1.3					2	0.0					2	0.0
16 July		135	0.0					1	0.0					1	0.0
17 July		331	0.0					1	0.0						
18 July	1	127	0.8												
19 July	1	127	0.8											1	0.0

Appendix Table 2. Continued.

Unit 6, Slot B (OPE)

Test date	Subyearling chinook			Yearling chinook			Steelhead			Coho			Sockeye		
	Desc.	Catch	%	Desc.	Catch	%	Desc.	Catch	%	Desc.	Catch	%	Desc.	Catch	%
9 May				10	225	4.4	13	724	1.8	1	47	2.1	1	50	2.0
10 May				12	233	5.15		665	0.0		20	0.0		58	0.0
11 May		2	0.0	20	302	6.62	2	421	0.5		25	0.0		32	0.0
12 May				7	190	3.7		604	0.0		33	0.0	1	24	4.2
16 May		1	0.0	9	304	3.0		225	0.0		14	0.0	2	27	7.4
17 May		2	0.0	8	327	2.4	1	741	0.1		7	0.0	1	37	2.7
18 May				8	138	5.8	1	1127	0.1		18	0.0		13	0.0
19 May				13	320	4.1	5	1399	0.4	1	48	2.1	1	14	7.1
20 May				6	243	2.5	2	1304	0.2		39	0.0		30	0.0
21 May		7	0.0	8	212	3.8		1104	0.0		68	0.0		24	0.0
22 May		1	0.0	7	198	3.5	3	1459	0.2	1	19	5.3		20	0.0
23 May		1	0.0	8	251	3.2	6	1756	0.3		5	0.0		18	0.0
24 May		2	0.0	21	207	10.1	4	1334	0.3		5	0.0		18	0.0
25 May		1	0.0	5	142	3.5	1	895	0.1		2	0.0	1	22	4.5
29 May		7	0.0	2	145	1.4	6	387	1.6		7	0.0		25	0.0
30 May		8	0.0	3	90	3.3		193	0.0		2	0.0		12	0.0
31 May		22	0.0	8	102	7.8		185	0.0		3	0.0		17	0.0
1 June	3	17	17.6	10	150	6.7		279	0.0		6	0.0	1	32	3.1
25 June		104	0.0		1	0.0		4	0.0						
26 June	1	154	0.7		1	0.0		2	0.0					2	0.0
27 June		50	0.0					1	0.0						
28 June		45	0.0					1	0.0						
29 June	29	586	5.0	3	5	0.6		4	0.0						
30 June		40	0.0											1	0.0
1 July	1	104	1.0		2	0.0		1	0.0				1	1	100.0
2 July	7	1071	0.7		4	0.0		8	0.0					3	0.0
3 July	64	1992	3.2	2	4	50.0									
8 July		102	0.0					4	0.0					1	0.0
9 July		26	0.0										1	1	100.0
10 July	5	33	15.1					2	0.0					1	0.0
11 July	2	123	1.6											1	0.0
12 July	2	69	2.9		1	0.0								1	0.0
13 July	17	240	7.1											1	0.0
15 July		10	0.0											1	0.0

Appendix Table 2. Continued.

Unit 7, Slot B (OPE)

Test date	Subyearling chinook			Yearling chinook			Steelhead			Coho			Sockeye		
	Desc.	Catch	%	Desc.	Catch	%	Desc.	Catch	%	Desc.	Catch	%	Desc.	Catch	%
9 May		2	0.0	3	59	5.1	1	32	3.1		20	0.0		9	0.0
10 May					40	0.0		38	0.0		15	0.0		11	0.0
11 May					76	0.0		35	0.0		16	0.0		16	0.0
12 May				1	108	0.9		59	0.0		33	0.0		12	0.0
16 May					100	0.0		11	0.0		34	0.0		11	0.0
17 May					60	0.0		15	0.0		9	0.0		8	0.0
18 May					25	0.0		61	0.0		30	0.0		5	0.0
19 May		1	0.0		45	0.0		52	0.0		27	0.0		10	0.0
20 May				1	46	2.2		73	0.0		37	0.0		5	0.0
21 May		2	0.0		96	0.0		105	0.0		39	0.0		20	0.0
22 May		1	0.0		45	0.0		116	0.0		17	0.0		15	0.0
23 May					36	0.0		79	0.0		3	0.0		5	0.0
24 May		3	0.0		48	0.0		79	0.0		5	0.0	1	6	16.7
25 May		1	0.0		68	0.0		72	0.0		3	0.0		22	0.0
29 May		2	0.0		34	0.0		29	0.0					4	0.0
30 May					12	0.0		41	0.0		1	0.0			
31 May		2	0.0		11	0.0		26	0.0					3	0.0
1 June		12	0.0		30	0.0		43	0.0					2	0.0
25 June	2	265	0.8												
26 June		289	0.0		2	0.0								1	0.0
27 June		41	0.0											1	0.0
28 June		30	0.0					1	0.0						
29 June	2	684	0.3		1	0.0		2	0.0						
30 June	1	173	0.6		2	0.0								1	0.0
1 July	2	175	1.1		7	0.0		1	0.0					1	0.0
2 July		258	0.0												
3 July	8	1118	0.7		4	0.0								2	0.0
8 July	3	142	2.1					1	0.0						
9 July	1	108	1.0					1	0.0				1		100.0
10 July	6	357	1.7		2	0.0		1	0.0						
11 July	4	162	2.5		1	0.0		2	0.0						
12 July	22	432	5.1		1	0.0									
13 July	21	580	3.6		1	0.0								2	0.0
15 July		31	0.0												

Appendix Table 2. Continued.

Unit 6, Slot B (short-term descaling tests)

Test date	Subyearling chinook			Yearling chinook			Steelhead			Coho			Sockeye		
	Desc.	Catch	%	Desc.	Catch	%	Desc.	Catch	%	Desc.	Catch	%	Desc.	Catch	%
11 May				4	321	1.2		79	0.0	1	287	0.3	1	28	3.6
12 May					9	0.0		47	0.0		22	0.0		14	0.0
15 May					126	0.0		34	0.0		28	0.0		35	0.0
16 May				2	150	1.3		45	0.0	1	43	2.3		25	0.0
17 May					137	0.0		220	0.0		50	0.0	1	44	2.3
18 May				1	365	0.3		342	0.0		120	0.0		42	0.0
19 May					197	0.0		44	0.0		42	0.0		19	0.0
20 May				1	98	1.0		25	0.0		32	0.0	1	18	5.5
21 May		1	0.0	1	131	0.8		68	0.0	1	30	3.3		34	0.0
22 May					142	0.0		133	0.0		9	0.0	2	33	6.1
23 May		3	0.0		98	0.0		34	0.0		11	0.0	1	54	1.9
24 May		3	0.0	1	89	1.1		134	0.0					26	0.0
25 May		3	0.0	1	109	0.9		31	0.0		1	0.0	3	48	6.3
28 May		2	0.0		160	0.0		45	0.0		6	0.0		17	0.0
29 May		9	0.0	2	139	1.4		54	0.0		8	0.0		13	0.0
30 May		2	0.0	6	76	7.9		33	0.0		6	0.0	1	16	6.3
31 May		2	0.0		43	0.0		17	0.0		2	0.0	3	18	16.7
24 June		101	0.0		3	0.0		1	0.0					1	0.0
25 June	2	101	1.9		1	0.0		3	0.0						
26 June	2	138	1.4		2	0.0		1	0.0						
27 June		30	0.0												
28 June		41	0.0					2	0.0						
29 June		93	0.0					1	0.0				1	1	100.0
30 June		17	0.0												
1 July		30	0.0		3	0.0		3	0.0						
2 July		85	0.0		1	0.0		2	0.0						
3 July	6	97	6.2		2	0.0									
8 July	2	159	1.6					2	0.0						
9 July		43	0.0					2	0.0						
10 July	1	68	1.5	1	1	100.0									
11 July	1	111	0.9												
12 July	1	56	1.8											1	0.0
15 July		44	0.0					1	0.0					1	0.0
16 July		31	0.0											1	0.0
17 July		6	0.0												
18 July		33	0.0												
19 July	1	9	0.1												