Vertical barrier screen studies at McNary Dam, 1994

CZES

Coastal Zone and Estuarine Studies Division

Northwest Fisheries Science Center

National Marine Fisheries Service

Seattle, Washington

by
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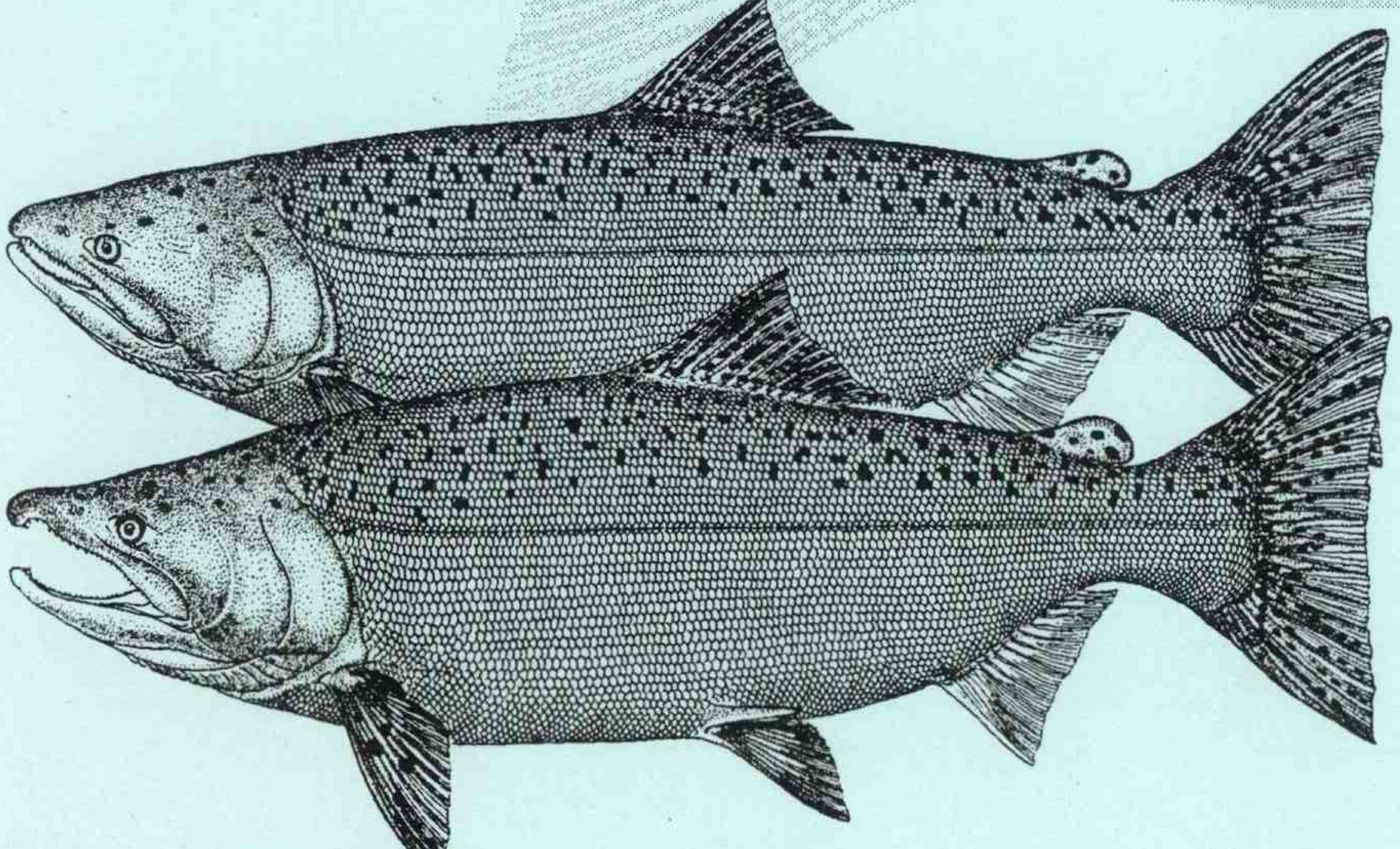
July 1995



VERTICAL BARRIER SCREEN STUDIES AT MCNARY DAM, 1994

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INTRODUCTION

Since 1991, the National Marine Fisheries Service (NMFS) has been testing extended-length screens for guiding juvenile salmonids (*Oncorhynchus* spp.) out of turbine intakes at McNary Dam on the Columbia River. Extended-length submersible traveling screens (ESTSs) and extended-length submersible bar screens (ESBSs), which are approximately 12.2 m in length, have produced consistently higher fish guidance efficiency (FGE) estimates than the 6.1-m, standard-length submersible traveling screens (STSs) currently installed (Brege et al. 1992; McComas et al. 1993, 1994). Based on the results of 3 years of testing and evaluation by NMFS, the ESBS has been recommended by the U.S. Army Corps of Engineers (COE) for future installation at McNary Dam.

However, compared to STSs, extended-length screens create higher gatewell flows because they divert more of the water from the turbine intake into the gatewell (Fig. 1). Hydraulic model studies at the COE's Waterways Experiment Station (WES) have shown that this increased flow produces excessive turbulence inside the gatewell, resulting mainly from flow separation along the upstream wall. Because of concern that the additional turbulence caused by the ESBS could affect overall descaling rates of juvenile salmonids, attention was focused on methods of modifying internal gatewell structures, particularly the vertical barrier screen (VBS), to minimize turbulence.

Each turbine unit is equipped with three intakes, with access to each provided through a bulkhead slot and an operating gate slot (Fig. 1). A vertical barrier screen is located between

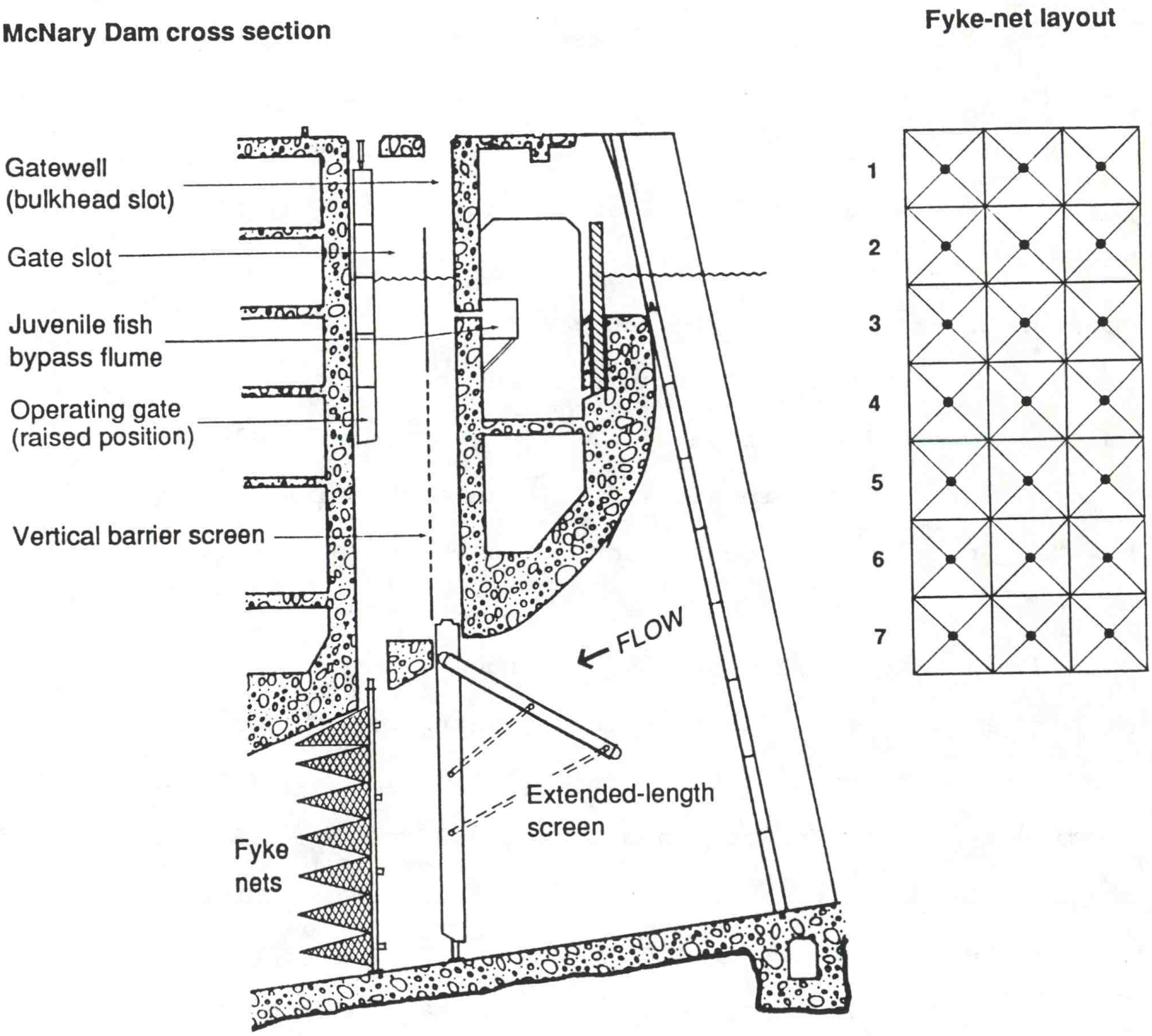

Figure 1. Cross section of turbine unit at McNary Dam with extended-length screen and fyke nets in place.

each bulkhead slot and operating gate slot. The VBS primarily functions to confine guided fish to the bulkhead slot, where fish pass through an orifice leading to the fish bypass flume. Excess water diverted into the gatewell by the guidance device passes through the VBS for return to the turbine intake.

Vertical barrier screen design has evolved during the course of fish guidance research. Initially, most VBSs were simple frameworks covered with polyester mesh on the lower portion of the upstream surface. Solid plate panels were installed on the upper portion of the VBSs to afford flow protection for fish in the vicinity of the gatewell orifice (Park et al. 1976; Jack Leigh, Hydraulic Design Branch, U.S. Army Corps of Engineers, Walla Walla District, Building 602, City-County Airport, Walla Walla, WA 99362, Pers. commun., February 1993). In 1981, model studies at the COE's Hydraulics Laboratory at Bonneville Dam indicated that attaching a 15% porosity perforated plate to the downstream side of the standard VBS frame would help spread flows more uniformly over the mesh surface (Krcma et al. 1983). This modification led to development of the balanced-flow vertical barrier screen (BFVBS). Later, the results of a study by Swan et al. (1983) at Lower Granite Dam suggested that smolt swimming performance could be improved in the vicinity of the gatewell orifices by changing the composition of solid plate panels at the upper end of the BFVBS. For subsequent FGE testing, the second and third panels from the top were altered so that the center third of each panel was solid plate, and the outer third on each side was polyester mesh. This modified BFVBS (MBFVBS) produced significantly lower descaling and higher orifice passage efficiency (OPE) compared to a standard VBS (Swan et al. 1985).

Balanced-flow vertical barrier screens were placed in gatewells at McNary Dam for FGE and OPE testing in 1982 (Krcma et al. 1983). Using the STS as a guidance device in combination with the BFVBS, mean descaling was 6-8% for yearling chinook salmon (*O. tshawytscha*) and generally less than 5% for subyearling chinook salmon (Krcma et al. 1983, McCabe and Krcma 1983, Swan and Norman 1987, Brege et al. 1988).

Modified balanced-flow vertical barrier screens were first installed at McNary Dam in 1991 at the beginning of extended-length screen testing. All slots in extended-length screen test units (Units 5 and 6), and the STS control slot (Slot 7B) were fitted with VBSs similar to those described by Swan et al. (1985). The bottom mesh panel of the MBFVBSs in slots with extended-length screens was replaced with a solid plate to help deflect flows up along the VBS. However, video camera monitoring by WES personnel indicated that fish were sometimes unable to avoid contact with the MBFVBS surface (Nestler and Davidson 1993, In prep.).

To reduce the descaling resulting from unstable flows in the gatewell, two new VBS systems were installed for testing at McNary Dam in 1994. Both systems were specifically designed to reduce gatewell turbulence when used with extended-length screens. Additional testing was planned to evaluate FGE using the new VBS systems in conjunction with ESBSs, and to compare alternative VBS surface preparations on fish condition. Specific research objectives at McNary Dam in 1994 were

1) Evaluate the effects of newly designed vertical barrier screen systems on juvenile salmonid descaling, particularly yearling and subyearling chinook salmon during the spring and summer outmigrations.
2) Evaluate fish guidance efficiency of extended-length submersible bar screens used with two newly designed vertical barrier screen systems.
3) Compare the effects of two VBS surface materials on juvenile salmonid descaling.
4) Compare the effects of vertical barrier screen streamlining on juvenile salmonid descaling.

OBJECTIVE 1: EVALUATE THE EFFECTS OF NEWLY DESIGNED VERTICAL BARRIER SCREEN SYSTEMS ON JUVENILE SALMONID DESCALING

Approach

Fish condition was determined for all salmonids using Fish Transportation Oversight Team descaling criteria (Ceballos et al. 1992). The overall descaling percentage for a given test was defined by species as the number of descaled, guided fish divided by the total number of guided fish.

Tests of the descaling effects of newly designed vertical barrier screens were conducted in Slots 5B and 6B. The VBS system installed in Slot 6B (VBS1) consisted of the VBS, an inlet flow vane, and a beam extension (Fig. 2a). The 7-m long inlet flow vane, designed to turn flows vertically into the gatewell, was attached to the top of the ESBS. Use of the vane required lowering the ESBS into the turbine intake 0.6 m below standard elevation. A beam extension was bolted to the turbine intake ceiling to eliminate the increased gap between the ceiling and the downstream end of the guidance screen.

The second VBS test system (VBS2) was installed in Slot 5B. In addition to a different VBS design, this system incorporated an expansion shape attached to the upstream wall of the test gatewell to reduce flow separation on entry into the gatewell (Fig. 2b).

Several modifications were common to both VBS test systems. The upstream surfaces of the test VBSs were No. 69 profile wire[1], and vertically variable perforated plate panels were used as a downstream surface to disperse flows within the gatewell more evenly over the entire VBS surface. Outlet flow control louvers were installed to control flow through the VBS-gatewell environment (Figs. 2a and 2b), and flow deflector bases were used on both test VBS systems to smooth flows during transition into the gatewell.

Extended-length bar screens with a perforated plate porosity of 30% were used as guidance devices in Slots 5B and 6B.

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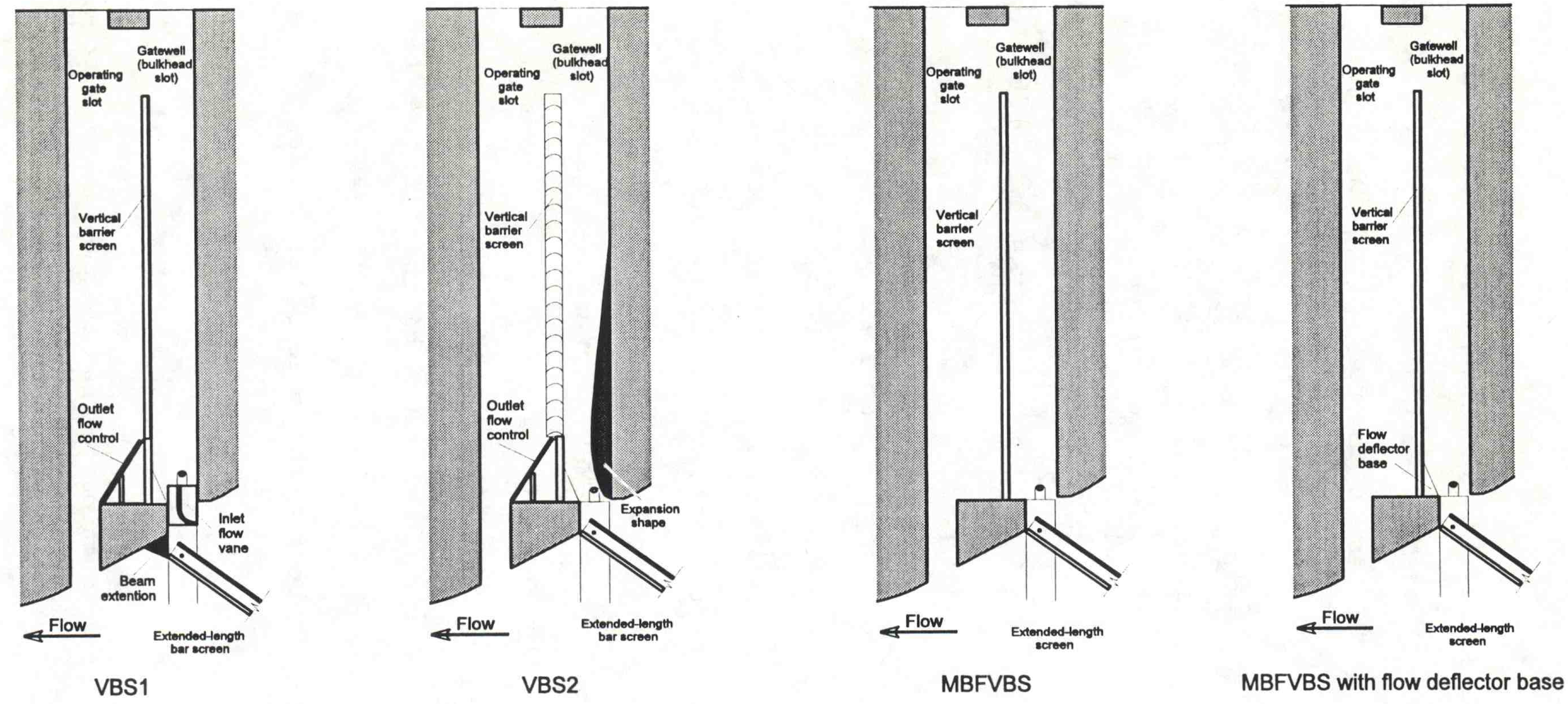
[1] Industry standard profile wire, composed of 1.8-mm wedge wire strands with 3.2-mm spaces between strands. Overall porosity of the surface was 62%.



2a 2b 2c 2d

Figure 2. Vertical barrier screen (VBS) configurations used during tests at McNary Dam, 1994.

Extended-length screens were used in adjacent A and C slots to maintain uniform flows in both test VBS gatewells. Initial conditions in descaling and FGE test slots for spring and summer test periods were as follows:

Turbine unit/slot	Guidance screen type	Perforated plate porosity (%)	Vertical barrier screen
5A	ESTS	25	MBFVBS
5B	ESBS	30	VBS2
5C	ESTS	36	MBFVBS
6A	ESTS	34	MBFVBS
6B	ESBS	30	VBS1
6C	ESBS	33	MBFVBS

Flows through Units 5 and 6 were 390 m^3/s (13,000 fps) during descaling comparisons and 450 m^3/s (15,000 fps) during concurrent FGE testing.[2] This resulted in a guidance screen approach water velocity of approximately 0.075 m^3/s (2.5 fps) with turbine-unit loads of about 75 MW.

Slot 7B, containing an STS and a MBFVBS, was used as a descaling control for test VBS comparisons (Fig. 2c). Flows through Unit 7 were constant at 390 m^3/s (13,000 fps).

As noted above, in order to accommodate the inlet flow vane, the ESBS in Slot 6B was lowered 0.6 m below standard elevation. All other guidance screens, including the control STS, were

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[2] Flows through FGE test turbine units were increased by 60 m^3/s (2,000 fps) to compensate for reductions caused by the fyke-net array and support structure placed in the turbine intake. This adjustment approximated normal turbine operation within the 1% peak efficiency range without fyke nets.

maintained at standard elevation with screen angles fixed at 55° for both spring and summer test periods.

Testing typically began at 2000 h and ended when enough juvenile chinook salmon had been collected from each test gatewell. Minimum test duration was 1 hour.

A minimum valid descaling sample size was 25. This is approximately the point at which data become normally distributed, which satisfies one of the assumptions of analysis of variance testing. In addition, with FGE expected to be high, 25 is approximately the number of fish that would be collected from the gatewell during an FGE test with the minimum sample size of 30 total fish. On days when fewer than 25 fish were captured, catches from 2 or more consecutive days were combined to make one valid sample. Samples ≥25 were not combined in order to maximize the number of replicates over time. The significance of observed differences in mean descaling between VBS treatments was examined statistically using randomized block analysis of variance (RBANOVA).

Results and Discussion

Test dates and conditions are listed in Table 1. Descaling catch data for both spring and summer sampling periods appear in Appendix Table 1. Results of statistical comparisons between treatments are summarized in Appendix Table 2.

Table 1. Test schedule for the 1994 field season at McNary Dam.

Test dates	Test type	Unit and slot	Guidance screen	Perforated plate porosity (%)	Operating gate position	VBS[a]	VBS surface treatment
18, 23 April	Des[b]	5A	ESTS[c]	25	NOG[d]/PROG[e]	MBFVBS[f]	polyester mesh, streamlined[g]
25-30 April	Des/FGE[h]	5B	ESBS[i]	30	NOG	VBS2[j]	profile wire
2-5 May	Des	5C	ESTS	36	NOG	MBFVBS	polyester mesh, streamlined
13, 14 May	Des	6A	ESTS	34	NOG/PROG	MBFVBS	profile wire
16, 17 May	Des/FGE	6B	ESBS	30	NOG	VBS1[k]	profile wire
	Des	6C	ESBS	33	NOG/PROG	MBFVBS	polyester mesh, standard[l]
	Des	7B	STS[m]	48	NOG	MBFVBS	polyester mesh, standard
18-21 May	Des	5A	ESTS	34	NOG/PROG	MBFVBS	polyester mesh, streamlined
23-27 May	Des/FGE	5B	ESBS	30	NOG	VBS2	profile wire
30, 31 May	Des	5C	ESBS	33	NOG/PROG	MBFVBS	polyester mesh, streamlined
1, 2 June	Des	6A	ESTS	25	NOG/PROG	MBFVBS	profile wire
	Des/FGE	6B	ESBS	30	NOG	VBS1	profile wire
	Des	6C	ESTS	36	NOG	MBFVBS	polyester mesh, standard
	Des	7B	STS	48	NOG	MBFVBS	polyester mesh, standard
20-24 June	Des	5A	ESTS	25	NOG	MBFVBS	polyester mesh, streamlined
27-30 June	Des/FGE	5B	ESBS	30	NOG	VBS2	profile wire
1, 5 July	Des	5C	ESTS	36	NOG	MBFVBS	polyester mesh, streamlined
11-13 July	Des	6A	ESTS	34	NOG	MBFVBS	profile wire
	Des/FGE	6B	ESBS	30	NOG	VBS1	profile wire
	Des	6C	ESBS	33	NOG	MBFVBS	polyester mesh, standard
	Des	7B	STS	48	NOG	MBFVBS	polyester mesh, standard
14-26 July	Des	5A	ESTS	34	NOG	MBFVBS	polyester mesh, streamlined
	Des/FGE	5B	ESBS	30	NOG	VBS2	profile wire
	Des	5C	ESBS	33	NOG	MBFVBS	polyester mesh, streamlined
	Des	6A	ESTS	25	NOG	MBFVBS	profile wire
	Des/FGE	6B	ESBS	30	NOG	VBS1	profile wire
	Des	6C	ESTS	36	NOG	MBFVBS	polyester mesh, standard
	Des	7B	STS	48	NOG	MBFVBS	polyester mesh, standard

[a] Vertical barrier screen.
[b] Descaling test.
[c] Extended-length submersible traveling screen.
[d] No operating gate (fully raised or removed).
[e] Partially raised operating gate (raised 2.4 m).
[f] Modified balanced-flow vertical barrier screen.
[g] Mesh attachment plates recessed level with VBS frame.
[h] Fish guidance efficiency test.
[i] Extended-length submersible bar screen.
[j] Newly designed vertical barrier screen system 2.
[k] Newly designed vertical barrier screen system 1.
[l] Polyester mesh retention plates on VBS frame surface.
[m] Standard-length submersible traveling screen.

Spring Outmigration

Descaling comparisons among VBS1, VBS2, and the control MBFVBS included 37 tests from 18 April through 2 June. There were no significant differences in mean descaling among the three treatments for yearling chinook salmon, steelhead (*O. mykiss*), or sockeye salmon (*O. nerka*) during the spring outmigration sampling period. Coho salmon (*O. kisutch*) numbers were inadequate for statistical comparisons. Mean percent descaling values (with standard errors) are summarized below.

Vertical barrier screen	Percent descaling (SE)			
	Yearling chinook	Steelhead	Coho	Sockeye
VBS1	7.9 (0.6)	8.1 (0.8)	5.6 (2.7)	31.9 (2.7)
VBS2	8.3 (0.6)	9.3 (0.8)	7.2 (3.0)	28.5 (2.7)
MBFVBS	7.9 (0.6)	6.9 (1.0)	5.9 (2.5)	31.3 (4.5)

There were no statistically significant differences in mean descaling among the three VBS types for yearling chinook salmon ($F = 0.29$, df = 2,71, $P = 0.751$), steelhead ($F = 0.50$, df = 2,63, $P = 0.608$), and sockeye salmon ($F = 0.41$, df = 2,56, $P = 0.668$). Therefore, despite the increased flows into the gatewell associated with the ESBSs, descaling using either VBS1 or VBS2 was comparable to that with the STS and an MBFVBS. For all three VBS types over all individual descaling tests combined, descaling averaged 8.1% (SE = 0.4) for yearling chinook salmon, 8.5% (SE = 3.3) for steelhead, 6.3% (SE = 2.0) for coho salmon, and 26.4% (SE = 2.0) for sockeye salmon.

Summer Outmigration

Tests were conducted to evaluate the effects of VBS type on subyearling chinook salmon descaling during a 26-sample series from 20 June through 26 July. Mean descaling values were 6.2% (SE = 0.6), 5.4% (SE = 0.6), and 7.0% (SE = 0.6) for VBS1, VBS2, and the MBFVBS, respectively. The differences were not statistically significant (F = 1.87, df = 2,50, P = 0.164).

OBJECTIVE 2: EVALUATE FISH GUIDANCE EFFICIENCY OF EXTENDED-LENGTH SUBMERSIBLE BAR SCREENS USED WITH TWO NEWLY DESIGNED VERTICAL BARRIER SCREEN SYSTEMS

Approach

Tests comparing FGE with VBS1 and VBS2 were conducted simultaneously with descaling tests in Slots 5B and 6B (Table 1). Methods for determining FGE were similar to those used previously for extended-length guidance screens at McNary Dam (Brege et al. 1992, McComas et al. 1993, McComas et al. 1994). The numbers of successfully guided fish were determined by gatewell catches using a modification of the dip basket described by Swan et al. (1979). Unguided fish were captured in fyke nets, which were installed through the operating gate slot and positioned directly downstream from the extended-length screen (Fig. 1). The fyke nets were deployed in a 21-element array (3 columns of 7 levels) spanning the entire turbine intake. Fish guidance efficiency was defined as the ratio of the gatewell catch to the total number of fish (by species) entering the turbine intake.

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

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

Sample sizes smaller than 30 fish were considered inadequate for statistical comparison. In cases where fewer than 30 fish were captured, catches from consecutive days were combined to provide a valid sample. An ANOVA was used to test the significance of differences between means for the two VBS treatments.

Dip-basket efficiency (DBE) test procedures were similar to those used in previous FGE studies (Krcma et al. 1985). Yearling chinook salmon and steelhead were marked by clipping a small portion of the upper lobe of the caudal fin. Marked fish were introduced into a test gatewell at the start of normal FGE testing and removed at the end of the test along with the gatewell catch. Dip-basket efficiency was defined for each species as the number of recaptured caudal-clipped fish divided by the total number of caudal-clipped fish released.

$$DBE = \frac{R}{M} \times 100\%$$

$$\text{where } R = \text{caudal-clipped fish recaptured}$$
$$M = \text{caudal-clipped fish released}$$

Results and Discussion

Dip-basket efficiency tests conducted in Slot 6B on 28 May resulted in 95% efficiency with yearling chinook salmon and 100% for steelhead. Because numbers of steelhead were low during the first test (34), another DBE test was conducted on 30 May that yielded 96% efficiency with a sample size of 50 fish. Combined DBE for the two tests with steelhead was 97%.

Catch data from both spring and summer outmigration test periods for individual FGE replicates are included in Appendix Table 3.

Spring Outmigration

Twenty-seven FGE tests were completed from 22 April through 2 June. Testing was interrupted from 5 through 12 May and from 28 through 29 May because of high numbers of sockeye salmon migrating past McNary Dam during those periods.

Mean percent FGE estimates (with standard errors) for all salmonids collected using both VBS types are summarized below.

Vertical barrier screen	Percent FGE (SE)			
	Yearling chinook	Steelhead	Coho	Sockeye
VBS1	85 (1)	91 (1)	99 (0)	71 (1)
VBS2	89 (1)	91 (1)	99 (0)	80 (1)

There was a significant difference in mean FGE estimates between VBS systems for yearling chinook salmon ($F = 15.02$, $df = 1,26$, $P = 0.0006$) and for sockeye salmon ($F = 22.34$, $df = 1,21$, $P = 0.0001$). Mean steelhead guidance values were statistically similar for both VBS systems ($F = 0.02$, $df = 1,21$, $P = 0.878$). Coho salmon numbers were insufficient for statistical analysis.

Yearling chinook salmon fyke-net catch distribution for each of the prototype VBS systems was comparable to earlier work with the operating gate fully raised or removed (McComas et al. 1994) (Fig. 1). Mean catches for all tests were concentrated in Net Levels 4 and 5, amounting to over 50% of the combined total fyke-net catch (Fig. 3). Less than 4% of the total fyke-net catch was in Net Levels 1 and 7 combined. With VBS2, mean catch in Net Level 2 (14.7%) was slightly higher than in Level 3 (12.1%).

Summer Outmigration

Fish guidance efficiency testing during the 1994 summer outmigration comprised a series of 23 samples from 20 June through 26 July. A turbine malfunction in Unit 5 briefly halted testing from 6 June through 10 June.

Mean subyearling chinook salmon FGE using VBS1 was 66% (SE = 3.0) compared to 67% (SE = 3.0) using VBS2. The difference was not significant ($F = 0.13$, $df = 1,22$, $P = 0.723$).

For both VBS systems combined, nearly 60% of the subyearling chinook salmon caught in the fyke nets were found in Net Levels 4 and 5 (Fig. 4). The catch distribution with VBS1 was similar to the distribution with yearling chinook salmon. With VBS2, catches in Net Level 2 (11.2%) were slightly lower for subyearling chinook salmon than for yearling chinook salmon.

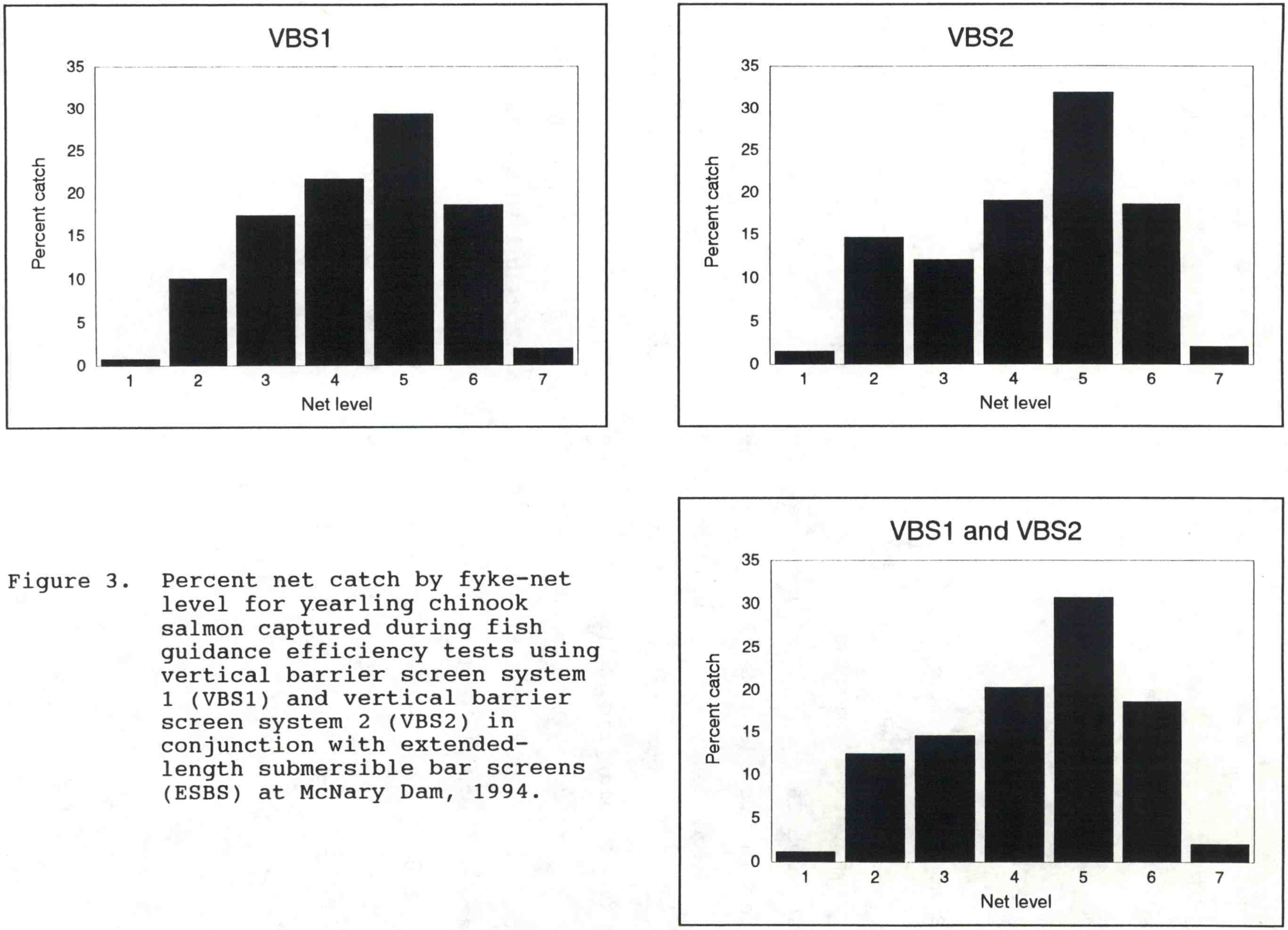


Figure 3. Percent net catch by fyke-net level for yearling chinook salmon captured during fish guidance efficiency tests using vertical barrier screen system 1 (VBS1) and vertical barrier screen system 2 (VBS2) in conjunction with extended-length submersible bar screens (ESBS) at McNary Dam, 1994.

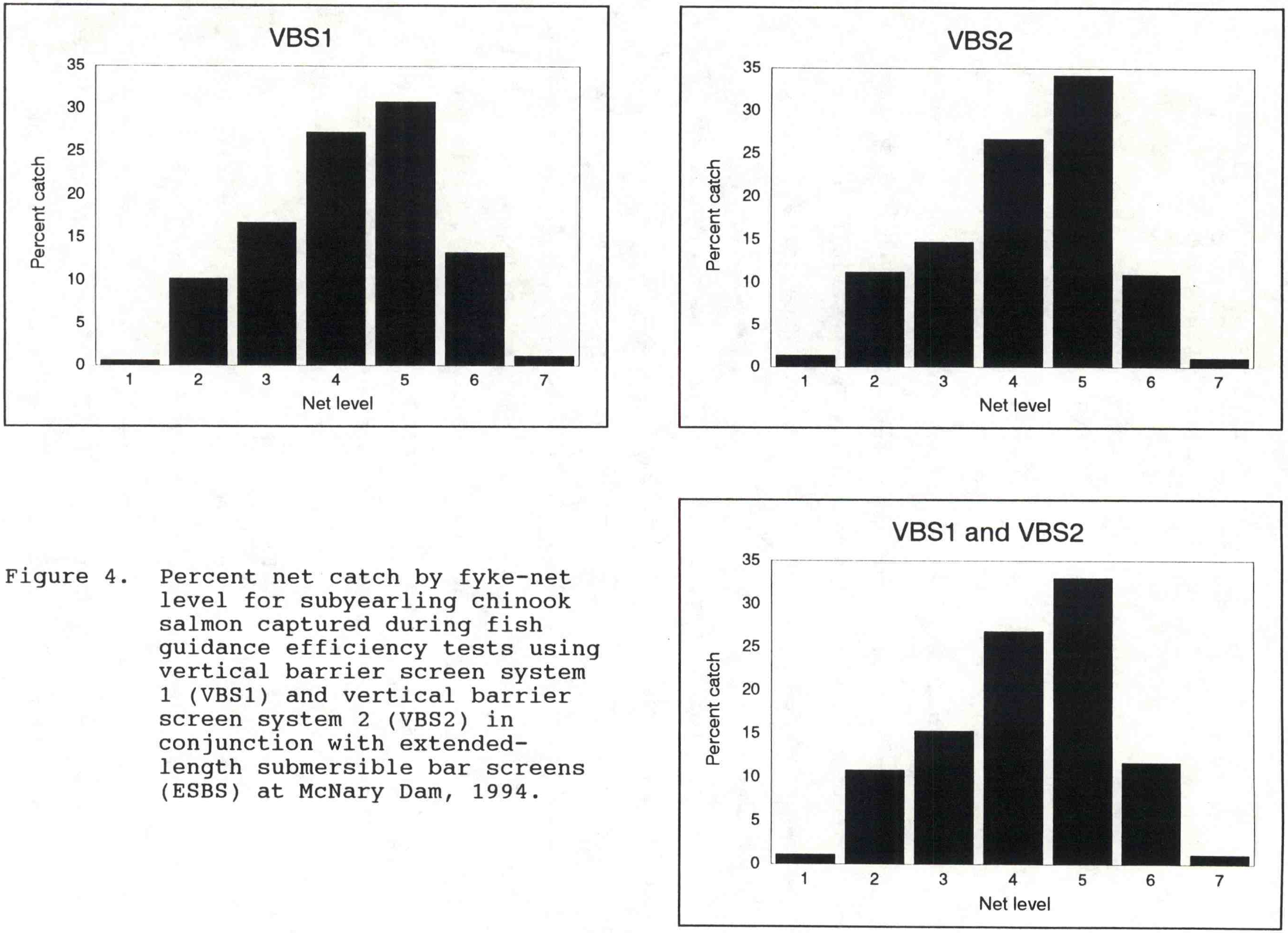


Figure 4. Percent net catch by fyke-net level for subyearling chinook salmon captured during fish guidance efficiency tests using vertical barrier screen system 1 (VBS1) and vertical barrier screen system 2 (VBS2) in conjunction with extended-length submersible bar screens (ESBS) at McNary Dam, 1994.

OBJECTIVE 3: COMPARE THE EFFECTS OF TWO VERTICAL BARRIER SCREEN SURFACE MATERIALS ON JUVENILE SALMONID DESCALING

Approach

Fish entering a gatewell are exposed to the upstream surface of the VBS. Depending upon their position in the water column upon entry into the gatewell, water turbulence, gatewell flows, and swimming ability, fish may make contact with the VBS surface.Therefore, the choice of material for the VBS surface could conceivably affect descaling. Two materials, profile wire and polyester mesh, were tested as possible alternatives for the new VBS designs.

Testing for differences in fish condition by surface-material type was conducted in Slots 5A and 6A. Slot 6A contained an MBFVBS frame surfaced with profile wire similar to that used on VBS1 and VBS2. The MBFVBS frame in Slot 5A had a surface of polyester mesh with 2.4 vertical and 2.4 horizontal 1 mm strands per cm^2. To make the surface of the VBS in 5A as flat as possible, the metal retaining straps holding the mesh in place were recessed into the VBS frame. The MBFVBSs in Slots 5A and 6A were fitted with flow-deflector bases similar to those used with VBS1 and VBS2 (Fig. 2d).

Extended-length traveling screens were used for the VBS surface-materials comparison. However, perforated plate porosities for the two ESTSs were different. The ESTS in Slot 5A had a perforated plate porosity of 25% at the start of both the spring and the summer test periods, while the porosity for the

ESTS in Slot 6A was 34%. A valid statistical comparison of material types necessitated exchanging the two ESTSs between test slots midway through each test series to reduce bias induced by differences in porosity.

Vertical barrier screen surface materials descaling tests were conducted concurrently with VBS system descaling and FGE tests, with flows through the A slots determined by FGE test requirements. Without fyke nets to reduce velocities through the turbine intake, elevated descaling levels were observed in the surface-materials test slots for yearling chinook salmon during the first 2 weeks of testing. Therefore, partially raised operating gates (PROG, raised 2.4 m above the stored position) were placed in Slots 5A and 6A to decrease descaling by reducing flows into the gatewells. Partially raised gates remained in place during the remainder of the spring outmigration test period. No operating gates (NOG, operating gate fully raised or removed) were used during descaling tests with subyearling chinook salmon.

Methods used for determining descaling were the same as those discussed under Objective 1. Statistical comparisons employed a two-factor ANOVA where single-day blocks were nested within guidance screen porosity (25 and 34%). Where differences were indicated, means were compared using Fisher's Protected Least Significant Difference multiple comparisons technique.

Results and Discussion

Descaling data from individual replicates for both the spring and summer outmigration test periods are presented in Appendix Table 1. Statistical analyses are summarized in Appendix Table 2.

Spring Outmigration

Mean percent descaling values (with standard errors) by VBS surface-material type for all salmonids collected are presented below.

	Percent descaling (SE)			
VBS surface material	Yearling chinook	Steelhead	Coho	Sockeye
Polyester mesh	13.8 (0.9)	8.5 (1.1)	2.3 (1.4)	39.3 (2.6)
Profile wire	12.7 (0.9)	8.5 (1.1)	2.2 (1.1)	43.7 (2.6)

The nested ANOVA design required equal sample sizes before and after the screen exchange. In cases where sample sizes were not equal, the latest samples taken (by date) were omitted to meet analysis criteria. The sockeye salmon comparison was very unbalanced for the porosity comparison (eight tests before the porosity exchange compared to only three afterward), so porosity was not considered a factor in the sockeye salmon ANOVA.

No significant difference in mean descaling was found between VBS surface materials for yearling chinook salmon ($F = 0.84$, $df = 1,26$, $P = 0.367$), steelhead ($F < 0.00$, $df = 1,18$, P = 0.982), and sockeye salmon (F = 1.43, df = 1,10, P = 0.259). Too few coho salmon were captured for statistical comparisons.

During spring surface-material comparison testing with steelhead, a significant interaction was found between guidance screen porosity and VBS surface-material type (F = 55.19, df = 1,18, P < 0.0001). It should be noted that logistic constraints prevented an optimal two-factor test design; screens were only exchanged between test slots once during each outmigration test period. Therefore, interaction between VBS surface material and perforated plate porosity was confounded by time. For example, before guidance screens were exchanged between Slots 5A and 6A, mean steelhead descaling for the polyester mesh surfaced MBFVBS used with the 25% porosity ESTS was 2.2% (SE = 1.5) compared to 3.4% (SE = 1.5) for the profile wire surfaced MBFVBS with the 34% porosity ESTS. After the exchange on 18 May, mean descaling increased to 14.8% (SE = 1.5) for the polyester mesh-surface with the 34% porosity ESTS and 13.5% (SE = 1.5) for the profile wire surface with the 25% porosity ESTS. Although this resulted statistically in an interaction between porosity and VBS surface-material type, the conclusion is difficult to support biologically. A significant difference can be interpreted as resulting from either an interaction between test conditions (i.e., the devices being tested) or the effects of time. It was apparent from these results that the observed effects were not related to a true interaction between the test conditions but to time, since descaling for both surface-material types was lower during the first part of the season and higher during the latter part of the season, regardless of the guidance screen perforated plate porosity (Fig. 5a). Therefore, in the analysis of these results, the statistically significant interaction terms were ignored and conclusions were drawn by looking at factors separately.

The increase in steelhead descaling later in the spring was also clearly evident with the ESBSs and new VBS systems in Slots 5B and 6B. The combined mean descaling (for both slots) was 3.0% from 23 April to 12 May and 14.1% from 18 May to 2 June. The spill program implemented at upriver dams beginning 11 May may have been a contributing factor in the observed increases in steelhead descaling.

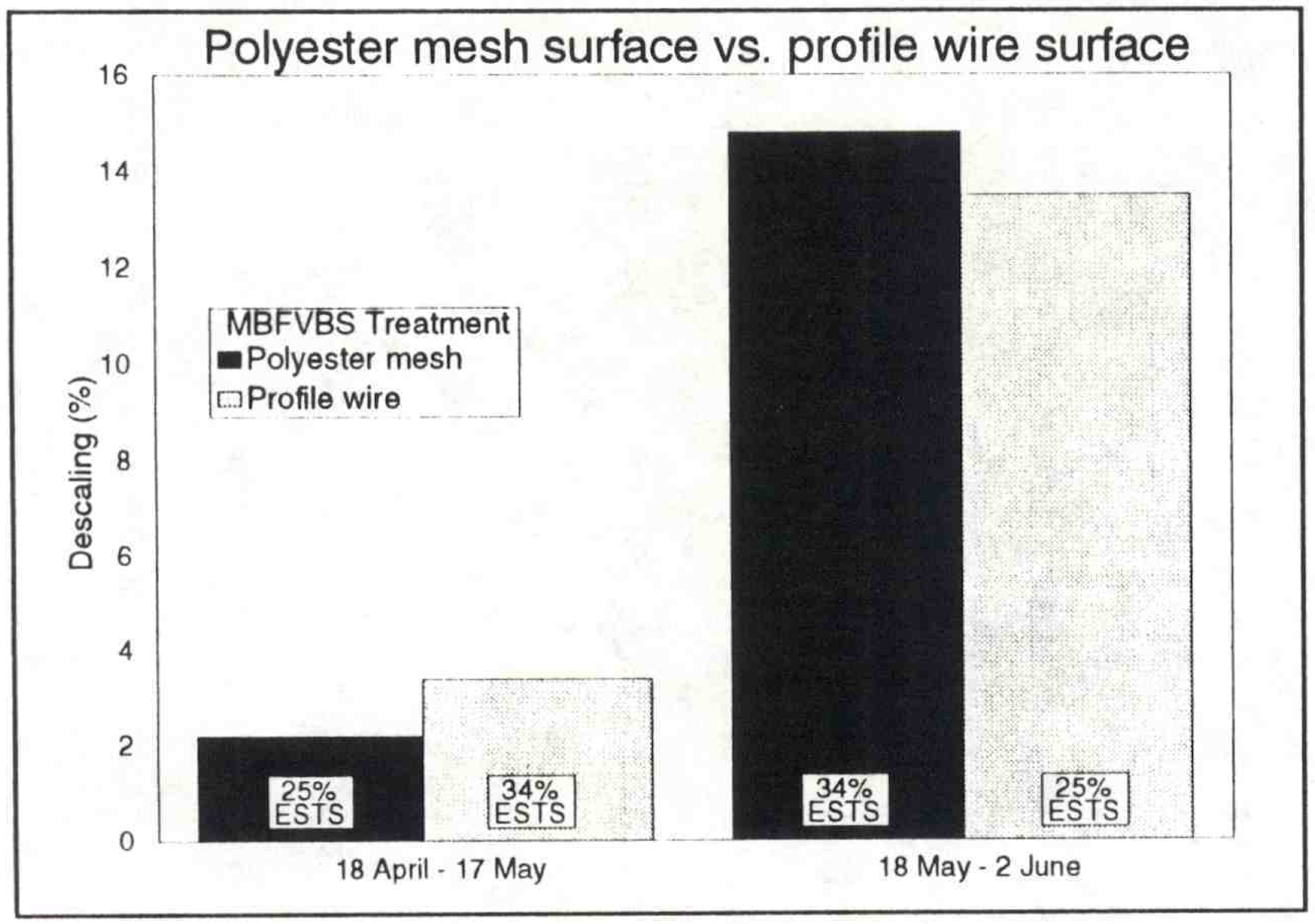
Summer Outmigration

Subyearling chinook salmon mean descaling values were 9.2% (SE = 1.4) using the MBFVBS with a polyester mesh surface and 13.2% (SE = 1.4) with a profile wire surface. The difference was not statistically significant ($F = 4.12$, $df = 1,22$, $P = 0.055$).

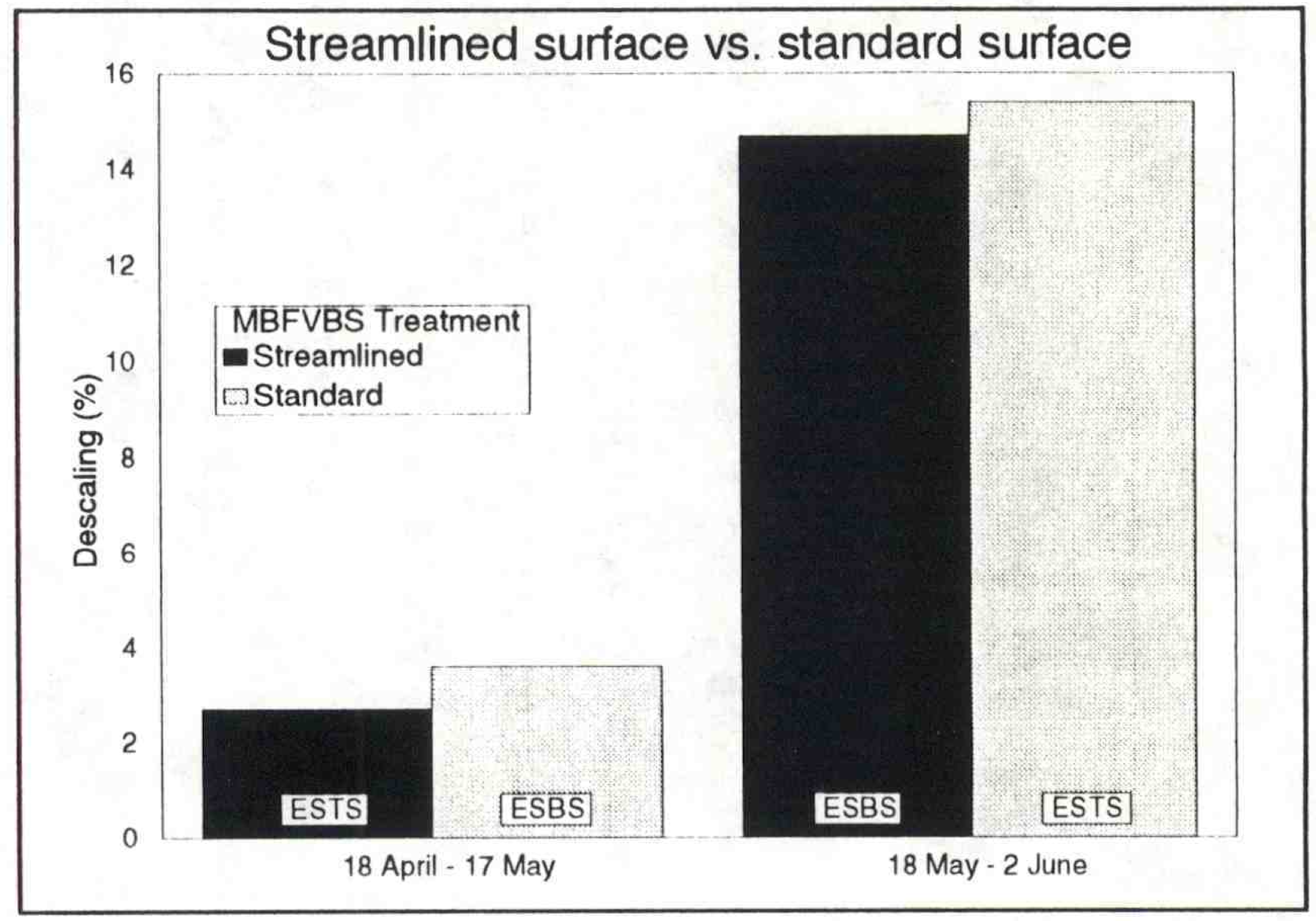
OBJECTIVE 4: COMPARE THE EFFECTS OF VERTICAL BARRIER SCREEN STREAMLINING ON JUVENILE SALMONID DESCALING

Approach

Polyester mesh is normally held in place on VBSs by horizontal metal bands bolted to the frame at approximately 1.2 m vertical intervals. Because they are surface mounted, the bands protrude into the water flow along the VBS surface, creating a



5a



5b

Figure 5. Mean percent steelhead descaling by modified balanced-flow vertical barrier screen (MBFVBS) surface treatment before and after guidance screens were exchanged (18 May), McNary Dam, 1994.

potential source of gatewell descaling. It was believed the VBS could be streamlined to reduce descaling by recessing the retaining straps and bolts into the frame, making them flush with the VBS surface. Comparison of the effects of streamlining was carried out in Slots 5C and 6C by testing the hypothesis that there would be no significant difference in descaling between streamlined and unmodified (standard) VBS surfaces.

Both slots contained an MBFVBS with polyester mesh on the upstream surface and a 20% perforated plate on the downstream surface. The VBS in Slot 5C had a streamlined surface consisting of recessed mesh retention straps and an inclined flow-deflector base, like that used for the MBFVBS in Slot 5A for Objective 3 (Fig. 2d). Slot 6C contained an unaltered MBFVBS (used in earlier tests with extended-length guidance screens) with surface-mounted (protruding) mesh retention straps and a solid vertical panel on the bottom.

Testing in Slots 5C and 6C was coincident with VBS comparisons in Slots 5B and 6B during spring and summer outmigrations with flow conditions dependent on FGE test requirements. Extended-length screens were used as guidance devices in both slots, but availability limited the options to a redesigned ESTS and an ESBS.

As in the VBS surface-materials tests, guidance screens were exchanged at the approximate midpoint of each outmigration test series in order to make valid statistical comparisons between VBS treatments. Also, because yearling chinook salmon descaling seemed excessive with the ESBS in Slot 6C during the first half of the spring outmigration (mean = 14.7%, SE = 3.6), a PROG was used to reduce flows into the gatewell for 5 days before the screens were exchanged on 18 May. After the exchange, the operating gate was used with the ESBS for 5 days in Slot 5C and then removed for the remainder of the test period to obtain a balanced data set. No operating gates were used during the summer test period with subyearling chinook salmon because descaling data did not indicate a need to dampen flows into the gatewell.

Methods for descaling determination and statistical analysis were identical to those discussed under Objective 1.

Results and Discussion

Descaling results are listed by test unit and slot in Appendix Table 1 for both spring and summer sample periods. The results of statistical comparisons are reported in Appendix Table 2.

Spring Outmigration

Mean percent descaling values (with standard errors) for each species by surface preparation are presented below.

	Percent descaling (SE)			
Surface preparation	Yearling chinook	Steelhead	Coho	Sockeye
Streamlined	11.6 (1.6)	8.7 (1.4)	7.5 (3.1)	31.8 (5.8)
Standard	13.7 (1.6)	9.5 (1.7)	0.9 (0.6)	29.5 (5.5)

For yearling chinook salmon, there was no significant interaction between guidance-screen type and VBS surface preparation (F = 0.02, df = 1,24, P = 0.884) and no statistical difference in mean descaling values between streamlined and standard surface treatments (F = 0.94, df = 1,24, P = 0.341). However, a significant difference was found between screen types (F = 4.90, df = 1,24, P = 0.037) with the ESBS (14.7%, SE = 1.3) higher than ESTS (10.6%, SE = 1.3).

Blocking by day was not used for steelhead analysis as small sample size problems precluded use of paired days. Steelhead descaling tests suffered the same inconsistency found in the materials testing for Objective 3 (Fig. 5b). Interaction between the guidance screen and MBFVBS surface streamlining was highly significant (F = 30.7, df = 1,30, P < 0.0001), while no significant difference was found separately for either guidance screen type (F = 1.1, df = 1,30, P = 0.303) or surface preparation (F = 0.16, df = 1,30, P = 0.690).

Insufficient numbers precluded statistical analysis for coho salmon. Sockeye salmon were not analyzed for guidance screen/VBS streamlining interaction due to unbalanced sample sizes between early-season and late-season testing. However, a single factor ANOVA revealed no significant difference in mean sockeye salmon descaling between surface preparations (F = 0.08, df = 1,17, P = 0.784).

Summer Outmigration

Statistically significant interaction between guidance screen type and MBFVBS surface preparation apparently affected subyearling chinook salmon descaling ($F = 10.43$, $df = 1,24$, $P = 0.004$) (Fig. 6). However, there was no difference in mean descaling values by either screen type ($F = 0.15$, $df = 1,24$, $P = 0.706$) or MBFVBS surface preparation ($F = 0.11$, $df = 1,24$, $P = 0.740$). Since descaling decreased for both treatments over the course of the summer test period, it is not unreasonable to assume, by the argument presented for steelhead above, that a time effect before and after the guidance screens were exchanged was more responsible for the observed results than was an interaction between the devices being tested.

CONCLUSIONS

1) There were no significant differences in mean descaling values for yearling and subyearling chinook salmon among VBS1 and VBS2 with extended-length bar screens and a control MBFVBS with a standard-length traveling screen.
2) For yearling chinook salmon, FGE with an extended-length bar screen in conjunction with VBS2 (89%) was significantly higher than with VBS1 (85%).
3) Differences in mean descaling values between polyester mesh and profile wire VBS surface materials for yearling and subyearling chinook salmon were not significant.

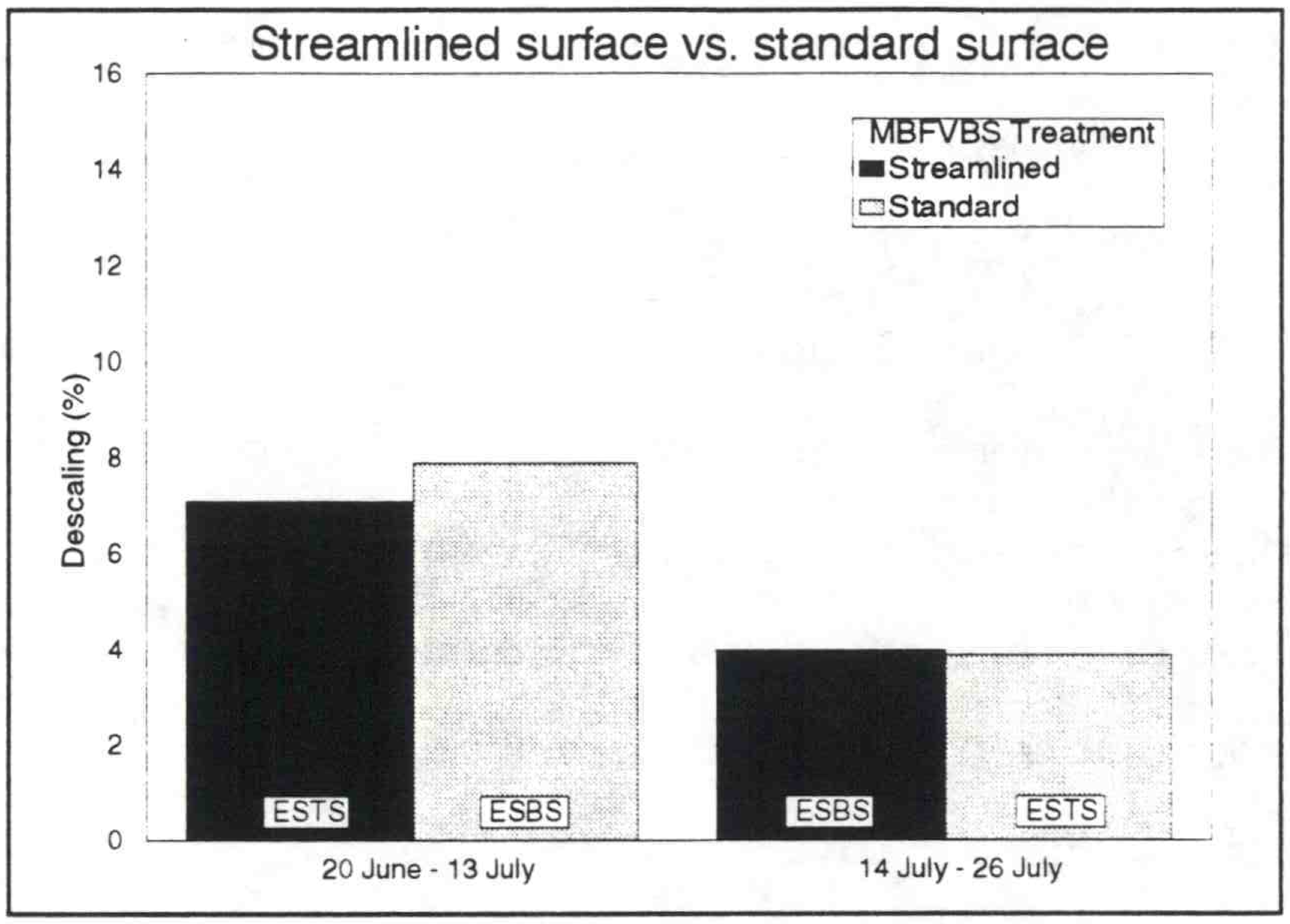


Figure 6. Mean percent subyearling chinook salmon descaling by modified balanced-flow vertical barrier screen (MBFVBS) treatment before and after guidance screens were exchanged (14 July), McNary Dam, 1994.

4) For yearling chinook salmon, there was no significant difference in descaling between a streamlined MBFVBS and standard MBFVBS.

5) For subyearling chinook salmon, there appeared to be a significant interaction between guidance-screen type and MBFVBS surface preparation. However, there were no differences at the factor level of the analysis, suggesting that observed statistical effects were related to biological descaling differences in fish over time rather than a true interaction between treatment components.

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APPENDIX

Appendix Table 1. Descaling data from fish guidance efficiency and descaling tests at McNary Dam, 1994.

Unit 5, Slot A

Test date	Subyearling chinook			Yearling chinook			Steelhead			Coho			Sockeye		
	Desc.[a]	Catch[b]	%[c]	Desc.	Catch	%	Desc.	Catch	%	Desc.	Catch	%	Desc.	Catch	%
18 April				5	21	23.8									
18 April				20	264	7.6	0	5	0.0				1	1	100.0
19 April				0	9	0.0									
19 April				13	102	12.7	0	1	0.0						
20 April				5	38	13.2	0	1	0.0				0	1	0.0
21 April				1	13	7.7	0	3	0.0						
22 April				6	60	10.0	0	18	0.0				0	4	0.0
23 April				25	147	17.0	0	31	0.0				1	9	11.1
25 April				18	123	14.6	2	92	2.2				10	23	43.5
26 April				13	88	14.8	5	146	3.4				11	30	36.7
27 April				6	84	7.1	92	1	1.2	0	2	0.0	3	13	23.1
28 April				8	67	11.9	0	63	0.0				3	9	33.3
29 April				15	87	17.2	2	48	4.2	0	1	0.0	15	39	38.5
30 April				17	100	17.0	3	119	2.5	0	2	0.0	31	110	28.2
2 May				13	137	9.5	3	98	3.1				53	187	28.3
3 May				9	133	6.8	4	70	5.7				65	164	39.6
4 May				17	176	9.7	3	102	2.9	0	11	0.0	183	490	37.3
17 May	0	1	0.0	10	111	9.0	3	8	37.5	1	13	7.7	1	3	33.3
18 May	0	2	0.0	18	103	17.5	7	29	24.1	1	9	11.1	3	9	33.3
19 May	0	1	0.0	9	111	8.1	1	7	14.2	0	3	0.0	2	5	40.0
20 May				25	116	21.6	0	2	0.0	0	3	0.0			
21 May				7	23	30.4	2	5	40.0						
23 May				21	78	26.9	6	44	13.4	1	2	50.0	4	5	80.0
24 May				13	119	9.2	7	18	38.9	0	2	0.0			
25 May				11	100	11.0	4	36	11.1	1	5	20.0	2	7	28.6
26 May				26	107	24.3	2	3	66.7	0	2	0.0	1	3	33.3
27 May	0	1	0.0	13	101	12.9	4	30	13.3	0	2	0.0	1	2	50.0
28 May				23	107	21.5	6	31	19.4				2	2	100.0
29 May	0	3	0.0	33	180	18.3	19	138	13.8	0	3	0.0	44	69	63.8
30 May				9	100	9.0	6	60	10.0	0	2	0.0	0	5	0.0
31 May	1	2	50.0	11	97	11.3	9	119	7.6	0	1	0.0	6	11	54.5

[a] Number of descaled fish captured by dipnet from gatewell.

[b] Total gatewell catch.

[c] Percent descaling [(number descaled / total gatewell catch) x 100].

Appendix Table 1. Continued.

Unit 5, Slot A

Test date	Subyearling chinook Desc.	Subyearling chinook Catch	Subyearling chinook %	Yearling chinook Desc.	Yearling chinook Catch	Yearling chinook %	Steelhead Desc.	Steelhead Catch	Steelhead %	Coho Desc.	Coho Catch	Coho %	Sockeye Desc.	Sockeye Catch	Sockeye %
1 June	0	2	0.0	13	93	14.0	5	83	6.0	0	2	0.0	9	10	90.0
2 June	0	1	0.0	7	83	8.4	18	123	14.6				11	20	55.0
20 June	13	126	10.3	0	1	0.0							1	1	100.0
21 June	16	117	13.7	0	9	0.0	4	9	44.4				1	2	50.0
23 June	18	103	17.5	0	1	0.0									
24 June	12	109	11.0	0	1	0.0									
27 June	7	109	6.4	0	2	0.0							1	2	50.0
28 June	5	114	4.0	0	1	0.0	1	1	100.0						
29 June	6	102	5.9												
30 June	9	121	7.4	0	1	0.0									
1 July	1	30	3.3												
5 July	6	132	4.4	0	1	0.0									
11 July	11	143	7.7	0	1	0.0									
12 July	1	114	.9												
13 July	7	126	5.6	0	1	0.0									
14 July	23	152	15.1												
15 July	17	121	14.0												
16 July	17	145	11.7												
17 July	14	114	12.3	0	1	0.0									
18 July	8	112	7.1												
19 July	6	130	4.6												
20 July	14	126	11.1												
21 July	6	107	5.6												
22 July	9	117	7.7	0	3	0.0									
23 July	6	99	6.1	0	1	0.0	0	1	0.0						
24 July	4	43	9.3												
25 July	8	24	33.3	0	1	0.0									
26 July	11	57	19.3												

Unit 5, Slot B

Test date	Subyearling chinook Desc.	Subyearling chinook Catch	Subyearling chinook %	Yearling chinook Desc.	Yearling chinook Catch	Yearling chinook %	Steelhead Desc.	Steelhead Catch	Steelhead %	Coho Desc.	Coho Catch	Coho %	Sockeye Desc.	Sockeye Catch	Sockeye %
18 April				3	55	5.5									
18 April				8	230	3.5	0	3	0.0				2	3	66.7
19 April				0	28	0.0	0	1	0.0				1	2	50.0

Appendix Table 1. Continued.

Unit 5, Slot B

Test date	Subyearling chinook			Yearling chinook			Steelhead			Coho			Sockeye		
	Desc.	Catch	%	Desc.	Catch	%	Desc.	Catch	%	Desc.	Catch	%	Desc.	Catch	%
19 April	0	1	0.0	2	92	2.2	0	2	0.0						
20 April				12	120	10.0	0	3	0.0				0	1	0.0
21 April				2	23	8.7	0	9	0.0						
22 April				9	79	11.4	0	22	0.0				0	4	0.0
23 April				27	263	10.3	0	77	0.0				6	20	30.0
25 April				12	213	5.6	2	101	2.0				4	29	13.8
26 April				6	75	8.0	1	84	1.2	0	1	0.0	5	28	17.9
27 April				7	76	9.2	1	49	2.0	0	2	0.0	2	12	16.7
28 April				11	99	11.1	2	65	3.1	0	10	0.0	6	19	31.6
29 April				13	93	14.0	1	44	2.3	0	1	0.0	9	54	16.7
30 April				10	110	9.1	4	153	2.6	1	2	50.0	39	176	22.2
2 May				13	204	6.4	8	130	6.2	0	1	0.0	51	280	18.2
3 May				7	185	3.8	2	61	3.3	0	3	0.0	27	254	10.6
4 May				9	236	3.8	4	135	3.0	2	15	13.3	222	1,036	21.4
11 May	0	1	0.0	7	94	7.4	0	10	0.0	2	30	6.7	1	16	6.3
12 May				5	113	4.4	4	37	10.8	4	61	6.6	5	18	27.8
13 May	0	2	0.0	23	301	7.6	0	19	0.0	5	93	5.4	9	39	23.1
14 May	0	1	0.0	38	344	11.0	4	24	16.7	1	39	2.6	17	71	23.9
16 May				5	40	12.5	0	3	0.0	0	5	0.0	2	7	28.6
17 May				47	492	9.6	5	73	6.8	5	53	9.4	50	131	38.2
18 May	0	12	0.0	47	553	8.5	5	119	4.2	2	31	6.5	137	183	74.9
19 May	0	10	0.0	27	535	5.0	8	34	23.5	0	7	0.0	42	162	25.9
20 May	0	9	0.0	37	403	9.2	2	16	12.5	0	17	0.0	17	67	25.4
21 May	0	1	0.0	15	120	12.5	1	9	11.1	0	1	0.0	4	21	19.0
23 May	0	5	0.0	13	91	14.3	15	42	2.4	1	4	25.0	34	127	26.8
24 May	0	5	0.0	9	90	10.0	3	17	17.6	1	7	14.3	11	66	16.7
25 May	0	5	0.0	16	142	11.3	23	103	22.3	0	5	0.0	32	149	21.5
26 May	0	6	0.0	54	441	12.2	35	206	17.0	0	10	0.0	172	399	43.1
27 May	0	6	0.0	25	196	12.8	9	83	10.8	1	1	100.0	50	177	28.2
28 May	0	1	0.0	6	109	5.5	3	43	7.0	1	3	33.3	11	26	42.3
29 May	0	1	0.0	8	101	7.9	13	57	22.8	0	5	0.0	2	12	16.7
30 May	0	4	0.0	13	157	8.3	12	135	8.9	0	1	0.0	32	104	30.8
31 May	1	10	10.0	11	138	8.0	11	130	8.5	0	3	0.0	39	104	37.5
1 June	0	1	0.0	8	125	6.4	25	125	20.0	0	1	0.0	34	83	41.0
2 June	0	12	0.0	11	103	10.7	22	222	9.9	0	1	0.0	27	51	52.9
20 June	31	388	8.0	1	34	2.9	20	32	62.5				4	9	44.4
21 June	21	254	8.3	1	25	4.0	7	13	53.8				2	8	25.0
23 June	27	357	7.6												
24 June	42	500	8.4	0	14	0.0	3	10	30.0				1	1	100.0
27 June	32	556	5.8	0	27	0.0	1	1	100.0				1	6	16.7
28 June	40	617	6.5	0	20	0.0	1	1	100.0						

Appendix Table 1. Continued.

Unit 5, Slot B

Test date	Subyearling chinook			Yearling chinook			Steelhead			Coho			Sockeye		
	Desc.	Catch	%	Desc.	Catch	%	Desc.	Catch	%	Desc.	Catch	%	Desc.	Catch	%
29 June	84	1208	7.0	0	9	0.0	2	3	66.7						
30 June	91	1682	5.4	0	44	0.0									
1 July	2	67	3.0				1	2	50.0						
5 July	36	1020	3.5	0	4	0.0									
11 July	20	446	4.5	0	1	0.0									
12 July	20	391	5.1	0	2	0.0									
13 July	19	232	8.2	1	1	100.0	0	4	0.0				0	1	0.0
14 July	6	128	4.7												
15 July	38	1,073	3.5	0	1	0.0									
16 July	12	416	2.9	0	1	0.0							0	1	0.0
17 July	21	883	2.4	0	3	0.0							0	1	0.0
18 July	3	227	1.3												
19 July	5	208	2.4	0	2	0.0	0	3	0.0						
20 July	11	424	2.6				1	3	33.3						
21 July	8	233	3.4	0	1	0.0									
22 July	6	308	1.9	0	1	0.0	0	1	0.0				0	2	0.0
23 July	6	158	3.8				0	3	0.0						
24 July	6	53	11.3												
25 July	7	50	14.0	1	1	100.0									
26 July	2	50	4.0	0	1	0.0									

Unit 5, Slot C

Test date	Subyearling chinook			Yearling chinook			Steelhead			Coho			Sockeye		
	Desc.	Catch	%	Desc.	Catch	%	Desc.	Catch	%	Desc.	Catch	%	Desc.	Catch	%
18 April				1	9	11.1									
18 April				11	176	6.3							1	2	50.0
19 April				1	13	7.7									
19 April				1	44	2.3	0	1	0.0						
20 April	0	1	0.0	2	22	9.1									
21 April				2	15	13.3	0	1	0.0						
22 April	0	1	0.0	2	58	3.4	0	8	0.0						
23 April				16	148	10.8	1	23	4.3	0	1	0.0	0	3	0.0
25 April				3	124	2.4	0	70	0.0	0	3	0.0	2	27	7.4
26 April				8	58	13.8	1	42	2.3				1	5	20.0
27 April				5	54	9.3	0	35	0.0	0	2	0.0	3	5	60.0
28 April				8	78	10.3	1	29	3.4	0	4	0.0	1	8	12.5
29 April				10	60	16.7	0	43	0.0	0	2	0.0	2	20	10.0

Appendix Table 1. Continued.

Unit 5, Slot C

Test date	Subyearling chinook			Yearling chinook			Steelhead			Coho			Sockeye		
	Desc.	Catch	%	Desc.	Catch	%	Desc.	Catch	%	Desc.	Catch	%	Desc.	Catch	%
30 April				8	31	25.8	2	69	2.9	2	2	100.0	21	42	50.0
2 May	0	1	0.0	9	136	6.6	4	49	8.2	0	1	0.0	25	203	12.3
3 May				6	106	5.7	2	27	7.4				29	122	23.8
4 May				5	101	5.0	1	46	2.2	0	8	0.0	96	480	20.0
17 May				9	104	8.7	0	2	0.0	2	4	50.0	2	7	28.6
18 May				25	100	25.0	1	35	2.9	3	17	17.6	3	8	37.5
19 May	0	1	0.0	10	105	9.5	2	6	33.3	1	6	16.7	2	7	28.6
20 May				2	46	4.3	2	4	50.0	1	3	33.3			
21 May				4	22	18.2	1	3	33.3				2	3	66.7
23 May				7	38	18.4	7	26	26.9	0	6	0.0	0	3	0.0
24 May				0	5	0.0	1	7	14.3	0	1	0.0			
25 May				12	89	13.5	9	48	18.8	1	3	33.3	7	14	50.0
26 May	0	1	0.0	20	103	19.4	1	7	14.3	0	1	0.0	3	3	100.0
27 May				8	84	9.5	5	39	12.8	0	2	0.0	1	3	33.3
28 May				19	99	19.2	20	81	24.7	0	1	0.0	2	4	50.0
29 May	0	2	0.0	7	84	8.3	17	93	18.3	1	3	33.3	1	2	50.0
30 May	0	3	0.0	8	101	7.9	5	66	7.6	0	3	0.0	8	17	47.1
31 May				4	71	5.6	5	66	7.6				4	5	80.0
1 June				10	75	13.3	10	82	12.2				3	6	50.0
2 June	0	3	0.0	17	79	21.5	9	116	7.8				6	10	60.0
20 June	12	107	11.2	0	2	0.0							1	2	50.0
21 June	7	88	8.0	0	5	0.0	1	2	50.0				1	2	50.0
23 June	5	62	8.1	0	1	0.0									
24 June	8	109	7.3	0	1	0.0									
27 June	17	100	17.0	0	3	0.0									
28 June	6	89	6.7	0	1	0.0									
29 June	26	330	7.9	0	1	0.0	0	1	0.0						
30 June	19	221	8.6	1	3	33.3									
1 July	1	39	2.6	0	1	0.0	1	1	100.0						
5 July	7	127	5.5												
11 July	7	185	3.8												
12 July	0	75	0.0												
13 July	5	96	5.2												
14 July	2	33	6.1												
15 July	8	196	4.1												
16 July	8	291	2.7												
17 July	4	114	3.5												
18 July	2	100	2.0												
19 July	5	109	4.5												
20 July	3	120	2.3	1	1	100.0	1	1	100.0						
21 July	3	51	5.9				0	1	0.0						

Appendix Table 1. Continued.

Unit 5, Slot C

Test date	Subyearling chinook			Yearling chinook			Steelhead			Coho			Sockeye		
	Desc.	Catch	%	Desc.	Catch	%	Desc.	Catch	%	Desc.	Catch	%	Desc.	Catch	%
22 July	2	88	2.3				0	1	0.0						
23 July	0	63	0.0												
24 July	2	44	4.5				0	1	0.0						
25 July	0	27	0.0	0	1	0.0									
26 July	4	29	13.8	1	2	50.0	0	1	0.0						

Unit 6, Slot A

Test date	Subyearling chinook			Yearling chinook			Steelhead			Coho			Sockeye		
	Desc.	Catch	%	Desc.	Catch	%	Desc.	Catch	%	Desc.	Catch	%	Desc.	Catch	%
18 April				1	27	3.7									
18 April				16	192	8.3	0	3	0.0				0	1	0.0
19 April				1	14	7.1							0	2	0.0
19 April	0	1	0.0	10	83	12.0	0	2	0.0						
20 April				6	45	13.3	0	1	0.0				0	1	0.0
21 April				3	23	13.0	0	2	0.0				0	1	0.0
22 April				10	62	16.1	0	27	0.0				0	7	0.0
23 April				28	179	15.6	0	34	0.0				9	20	45.0
25 April				12	124	9.7	1	65	1.5	0	2	0.0	19	27	70.4
26 April	0	1	0.0	12	82	14.6	2	71	2.8				13	25	52.0
27 April	0	1	0.0	16	97	16.5	3	78	3.8	0	2	0.0	9	13	69.2
28 April				22	120	18.3	3	59	5.1	3	1	33.3	6	17	35.3
29 April	0	1	0.0	11	86	12.8	0	47	0.0				12	38	31.6
30 April				15	143	10.5	9	129	7.0				51	144	35.4
2 May	0	1	0.0	16	128	12.5	5	99	5.1				68	228	29.8
3 May				23	165	13.9	6	70	8.6	0	1	0.0	100	203	49.3
4 May				12	111	10.7	1	57	1.8	0	7	0.0	296	635	46.6
17 May				10	102	9.8	0	7	0.0	0	5	0.0	1	1	100.0
18 May				18	100	18.0	1	26	3.8	2	15	13.3	2	5	40.0
19 May	0	3	0.0	6	107	5.6	0	6	0.0	1	5	20.0	0	2	0.0
20 May	0	2	0.0	9	71	12.7	2	5	40.0	1	6	16.7	0	1	0.0
21 May				3	22	13.6	0	2	0.0				1	3	33.3
23 May				8	44	18.2	5	36	13.9	0	3	0.0	5	8	62.5
24 May				1	32	3.1	4	10	40.0	0	6	0.0			
25 May				11	102	10.8	13	54	24.1	0	3	0.0	2	7	28.6

Appendix Table 1. Continued.

Unit 6, Slot A

Test date	Subyearling chinook			Yearling chinook			Steelhead			Coho			Sockeye		
	Desc.	Catch	%	Desc.	Catch	%	Desc.	Catch	%	Desc.	Catch	%	Desc.	Catch	%
26 May	0	1	0.0	14	103	13.6	5	26	19.2				2	3	66.7
27 May				15	100	15.0	2	15	13.3	0	4	0.0	0	1	0.0
28 May				16	103	15.5	8	65	12.3	0	1	0.0	7	14	50.0
29 May	0	1	0.0	12	94	12.8	7	93	7.5	0	3	0.0	1	3	33.3
30 May	0	1	0.0	10	99	10.1	5	45	11.1	0	2	0.0	2	9	22.2
31 May	0	3	0.0	6	57	10.5	8	81	9.9	0	1	0.0	3	8	37.5
1 June	0	1	0.0	7	63	11.1	9	89	10.1	0	1	0.0	6	9	66.7
2 June	0	3	0.0	10	92	10.9	19	89	21.4				12	18	66.7
20 June	33	183	18.0	1	30	3.3	3	3	100.0				2	5	40.0
21 June	14	106	13.2	2	7	28.6							2	3	66.7
23 June	33	142	23.2												
24 June	9	113	8.0	0	5	0.0									
27 June	28	110	25.5	2	9	22.2									
28 June	24	129	18.6												
29 June	21	156	13.5	0	1	0.0									
30 June	29	122	23.8	1	3	33.3									
1 July	23	107	21.5	0	1	0.0	2	2	0.0						
5 July	21	127	16.5												
11 July	26	129	20.2	0	1	0.0									
12 July	2	118	1.7	0	1	0.0									
13 July	10	89	11.2	0	2	0.0	1	2	50.0						
14 July	5	50	10.0	1	2	50.0	2	2	100.0						
15 July	12	132	15.9												
16 July	16	167	9.6				0	1	0.0						
17 July	6	142	4.2												
18 July	16	95	16.8				0	1	0.0						
19 July	10	116	8.6												
20 July	5	108	4.6	0	1	0.0									
21 July	5	129	3.9												
22 July	16	125	12.8	1	1	100.0									
23 July	3	64	4.7				0	1	0.0						
24 July	2	50	4.0	0	1	0.0									
25 July	4	44	9.1	1	3	33.3									
26 July	10	36	27.8	1	1	100.0	1	3	33.3						

Appendix Table 1. Continued.

Unit 6, Slot B

Test date	Subyearling chinook			Yearling chinook			Steelhead			Coho			Sockeye		
	Desc.	Catch	%	Desc.	Catch	%	Desc.	Catch	%	Desc.	Catch	%	Desc.	Catch	%
18 April				1	36	2.8									
18 April				9	226	4.0									
19 April				1	33	3.0							0	2	0.0
19 April				8	122	6.6	0	1	0.0						
20 April				3	48	6.3	0	2	0.0				1	1	100.0
21 April	0	1	0.0	1	23	4.3	0	2	0.0						
22 April				3	77	3.9	1	12	8.3				1	2	50.0
23 April				18	219	8.2	4	75	5.3				3	18	16.7
25 April				10	168	6.0	2	122	1.6	0	2	0.0	3	25	12.0
26 April	0	1	0.0	40	62	64.5	1	80	1.3				1	16	6.3
27 April				7	79	8.9	2	96	2.1	0	2	0.0	2	7	28.6
28 April				3	104	2.9	1	87	1.1				4	9	44.4
29 April				0	56	0.0	1	46	2.2				10	46	21.7
30 April				11	121	9.1	4	146	2.8	1	1	100.0	21	134	15.7
2 May	0	4	0.0	11	188	5.9	4	130	3.1				38	299	12.7
3 May				8	163	4.9	3	62	4.8	0	1	0.0	31	177	17.5
4 May				7	138	5.1	2	98	2.0	8	1	12.5	163	949	17.2
11 May	0	1	0.0	3	76	3.9	0	9	0.0	2	25	8.0	7	30	23.3
12 May				12	178	6.7	2	31	6.4	1	51	2.0	9	42	21.4
13 May	0	1	0.0	21	273	7.7	1	5	20.0	3	121	2.5	9	31	29.0
14 may				11	221	5.0	3	29	10.3	0	32	0.0	12	45	26.7
16 May				4	71	5.6	0	4	0.0	1	18	5.6	7	18	38.9
17 May				14	223	6.3	1	29	3.4	1	25	4.0	46	137	33.6
18 May	0	7	0.0	21	291	7.2	7	162	4.3	2	21	9.5	56	186	30.1
19 May	0	7	0.0	14	198	7.1	1	16	6.3	0	8	0.0	20	114	17.5
20 May	0	2	0.0	9	116	7.8	0	8	0.0	0	2	0.0	15	37	40.5
21 May	0	5	0.0	15	76	19.7	2	9	22.2	0	1	0.0	7	19	36.8
23 May	0	8	0.0	12	97	12.4	11	44	25.0	3	11	27.3	95	264	36.0
24 May				4	27	14.8	2	10	20.0				19	96	19.8
25 May	0	2	0.0	7	81	8.6	16	65	24.6	0	4	0.0	66	133	49.6
26 May				55	299	18.4	24	141	17.0	2	13	15.4	204	364	56.0
27 May	0	3	0.0	17	171	9.9	8	61	13.1	0	3	0.0	67	152	44.1
28 May				14	155	12.2	7	64	10.9				24	68	35.3
29 May	0	2	0.0	11	101	10.9	3	28	10.7	0	4	0.0	1	3	33.3
30 May	0	8	0.0	16	143	11.2	11	133	8.3	1	4	25.0	58	106	54.7
31 May	0	10	0.0	8	64	12.5	11	61	18.0	0	1	0.0	20	36	55.6
1 June	3	5	60.0	9	90	10.0	8	86	9.3				61	102	59.8
2 June	0	8	0.0	11	125	8.8	20	162	12.3	0	1	0.0	22	49	44.9
20 June	28	254	11.0	1	11	9.1	7	7	100.0				1	2	50.0
21 June	10	135	7.4	2	17	11.8	2	4	50.0				0	1	0.0

Appendix Table 1. Continued.

Unit 6, Slot B

Test date	Subyearling chinook			Yearling chinook			Steelhead			Coho			Sockeye		
	Desc.	Catch	%	Desc.	Catch	%	Desc.	Catch	%	Desc.	Catch	%	Desc.	Catch	%
23 June	23	275	8.4	1	1	100.0									
24 June	9	121	7.4	0	8	0.0									
27 June	114	8	7.0	0	3	0.0	1	1	100.0						
28 June	15	367	4.1	0	3	0.0									
29 June	12	351	3.4	0	2	0.0									
30 June	19	274	6.9	1	4	25.0									
1 July	9	107	8.4	0	3	0.0	0	1	0.0						
5 July	61	1052	5.8	0	4	0.0									
11 July	19	404	4.7												
12 July	3	184	1.6										1	1	100.0
13 July	4	126	3.2				1	2	50.0						
14 July	15	131	11.5	0	1	0.0	1	1	100.0				0	1	0.0
15 July	22	472	4.7												
16 July	9	507	1.8										0	1	0.0
17 July	13	533	2.4	1	1	100.0									
18 July	8	269	3.0												
19 July	11	341	3.2				3	4	75.0						
20 July	11	216	5.1	0	2	0.0									
21 July	7	243	2.9				0	1	0.0				0	1	0.0
22 July	16	234	6.8	0	1	0.0									
23 July	8	77	10.4				0	1	0.0						
24 July	4	50	8.0												
25 July	6	50	12.0												
26 July	5	50	10.0												

Unit 6, Slot C

Test date	Subyearling chinook			Yearling chinook			Steelhead			Coho			Sockeye		
	Desc.	Catch	%	Desc.	Catch	%	Desc.	Catch	%	Desc.	Catch	%	Desc.	Catch	%
18 April				0	6	0.0									
18 April				13	225	5.8	0	2	0.0				0	2	0.0
19 April				0	7	0.0									
19 April				1	54	1.9									
20 April				11	24	45.8	0	4	0.0						
21 April				1	6	16.7	0	1	0.0						

Appendix Table 1. Continued.

Unit 6, Slot C

Test date	Subyearling chinook			Yearling chinook			Steelhead			Coho			Sockeye		
	Desc.	Catch	%	Desc.	Catch	%	Desc.	Catch	%	Desc.	Catch	%	Desc.	Catch	%
22 April				9	45	20.0	0	7	0.0						
23 April				17	112	15.2	0	27	0.0				3	13	23.1
25 April				30	122	24.6	1	67	1.5	0	1	0.0	13	28	46.4
26 April				6	46	13.0	0	23	0.0	0	1	0.0	4	13	30.8
27 April				14	73	19.2	0	24	0.0				0	3	0.0
28 April	0	1	0.0	8	58	13.8	2	40	5.0	0	3	0.0	5	11	45.5
29 April				6	34	17.6	1	21	4.8	0	1	0.0	7	28	25.0
30 April	0	1	0.0	8	49	16.3	1	57	1.7	0	2	0.0	23	112	20.5
2 May				13	110	11.8	5	45	11.1	0	8	0.0	37	192	19.3
3 May				6	71	8.5	1	18	5.6				6	26	23.1
4 May				4	58	6.9	1	20	5.0	1	8	12.5	135	628	21.5
17 May				8	38	21.1	1	7	14.3	0	14	0.0	7	10	70.0
18 May	0	2	0.0	7	95	7.4	7	36	19.4	1	5	20.0	2	9	22.2
19 May	0	1	0.0	3	61	4.9	0	8	0.0	0	5	0.0	1	6	16.7
20 May	0	1	0.0	8	26	30.8	0	1	0.0	0	3	0.0	3	11	27.3
21 May	0	1	0.0	2	15	13.3	0	1	0.0	0	3	0.0	0	4	0.0
23 May				2	35	5.7	3	11	27.3	0	3	0.0	0	5	0.0
24 May				0	4	0.0	0	2	0.0	0	1	0.0	0	1	0.0
25 May				3	48	6.3	8	25	32.0	0	1	0.0			
26 May				15	100	15.0	5	19	26.3	0	3	0.0	6	20	30.0
27 May				9	78	11.5	6	25	24.0	0	1	0.0	7	7	100.0
28 May				5	42	11.9	4	24	16.7				1	2	50.0
29 May				5	46	10.9	4	31	12.9				0	2	0.0
30 May				8	54	14.8	3	43	7.0	0	1	0.0	7	9	77.8
31 May				2	33	6.1	2	21	9.5				0	2	0.0
1 June				6	47	12.8	4	45	8.9				4	5	80.0
2 June	0	2	0.0	6	62	9.7	5	55	9.1				2	2	100.0
20 June	10	113	8.8	1	6	16.7	3	6	50.0				1	2	50.0
21 June	10	80	12.5	1	6	16.7	2	2	100.0				2	2	100.0
23 June	23	121	19.0												
24 June	11	115	9.6				1	1	100.0						
27 June	5	103	4.9	0	2	0.0									
28 June	10	114	8.8												
29 June	3	90	3.3												
30 June	4	130	3.1	0	1	0.0									
1 July	5	49	10.2												
5 July	7	119	5.9												
11 July	15	136	11.0										0	1	0.0
12 July	0	62	0.0										0	1	0.0
13 July	6	101	5.9	0	2	0.0									

Appendix Table 1. Continued.

Unit 6, Slot C

Test date	Subyearling chinook			Yearling chinook			Steelhead			Coho			Sockeye		
	Desc.	Catch	%	Desc.	Catch	%	Desc.	Catch	%	Desc.	Catch	%	Desc.	Catch	%
14 July	10	61	16.4	0	1	0.0	1	1	100.0						
15 July	6	108	5.6												
16 July	1	102	1.0												
17 July	1	72	1.4												
18 July	3	173	1.7												
19 July	6	70	8.6				1	1	100.0						
20 July	58	1	1.7	0	1	0.0	1	1	100.0						
21 July	5	148	3.4				0	1	0.0						
22 July	1	40	2.5												
23 July	2	42	4.8												
24 July	0	50	0.0												
25 July	1	29	3.4	0	2	0.0	1	4	25.0						
26 July	0	27	0.0												

Unit 7, Slot B

Test date	Subyearling chinook			Yearling chinook			Steelhead			Coho			Sockeye		
	Desc.	Catch	%	Desc.	Catch	%	Desc.	Catch	%	Desc.	Catch	%	Desc.	Catch	%
18 April				7	147	4.8									
18 April				3	137	2.2									
19 April				11	317	3.5	0	1	0.0				0	1	0.0
19 April				12	218	5.5	0	2	0.0						
20 April				15	216	6.9	0	1	0.0				0	3	0.0
21 April				3	93	3.2	0	6	0.0				0	2	0.0
22 April	0	1	0.0	11	93	11.8	0	13	0.0				1	1	100.0
23 April				9	196	4.6	1	36	2.8				3	8	37.5
25 April				45	193	23.3	0	101	0.0	0	1	0.0	14	40	35.0
26 April	0	1	0.0	4	60	6.7	2	82	2.4				4	11	36.4
27 April	0	1	0.0	3	67	4.5	1	46	2.2	0	1	0.0	1	3	33.3
28 April				9	104	8.7	4	61	6.6	0	1	0.0	5	8	62.5
29 April				4	46	8.7	0	18	0.0	0	1	0.0	5	18	27.8
30 April				8	124	6.5	1	56	1.8				33	133	24.8
2 May				26	335	7.8	10	171	5.8				73	247	29.6
3 May				11	192	5.7	0	23	0.0	0	2	0.0	24	78	30.8
4 May				4	151	2.6	1	17	5.9	0	10	0.0	61	243	25.1
11 May				3	99	3.0	2	11	18.2	1	69	1.4	2	8	25.0

Appendix Table 1. Continued.

Unit 7, Slot B

Test date	Subyearling chinook			Yearling chinook			Steelhead			Coho			Sockeye		
	Desc.	Catch	%	Desc.	Catch	%	Desc.	Catch	%	Desc.	Catch	%	Desc.	Catch	%
12 May				5	101	4.8	1	8	12.5	2	51	3.9	3	7	42.9
13 May				9	102	8.8	1	1	100.0	0	22	0.0	2	6	33.3
14 May				19	105	18.1	2	9	4.5	0	18	0.0	2	4	50.0
16 May	0	1	0.0	10	145	6.9	1	3	33.3	1	14	7.1	0	2	0.0
17 May	0	1	0.0	14	82	17.1	0	9	0.0	3	11	27.3			
18 May				5	104	4.8	1	10	10.0	2	6	33.3	4	12	33.3
19 May	0	1	0.0	6	99	6.1	0	6	0.0	1	4	25.0	0	5	0.0
20 May	0	2	0.0	6	105	5.7	1	14	7.1	0	9	0.0	0	2	0.0
21 May				10	104	9.6	0	3	0.0	1	2	50.0	3	8	37.5
23 May	0	1	0.0	10	102	9.8	4	24	16.7	0	4	0.0	4	9	44.4
24 May				11	101	10.9	3	10	30.0	3	4	75.0			
25 May				11	107	10.3	4	10	40.0	0	1	0.0			
26 May	0	1	0.0	15	98	15.3	0	4	0.0	0	2	0.0	1	4	25.0
27 May	0	1	0.0	11	105	10.5	0	4	0.0				1	1	100.0
28 May				4	84	4.8	2	36	5.6				0	2	0.0
29 May	0	1	0.0	5	101	5.0	0	7	0.0				0	3	0.0
30 May	0	4	0.0	6	119	5.0	7	7	9.2	0	3	0.0	14	35	40.0
31 May	0	2	0.0	0	29	0.0	0	36	0.0				1	3	33.3
1 June				9	106	8.5	2	16	12.5	0	2	0.0	1	4	25.0
2 June	1	4	25.0	27	143	18.9	2	30	6.7				4	5	80.0
20 June	12	121	9.9	1	8	12.5									
21 June	25	109	22.9	2	17	11.8	15	35	42.9				2	3	66.7
23 June	17	214	7.9	0	3	0.0	1	6	16.7						
24 June	10	108	9.3												
27 June	6	108	5.6	0	3	0.0							1	1	100.0
28 June	9	130	6.9	0	1	0.0	1	2	50.0						
29 June	8	120	6.7												
30 June	6	110	5.5												
1 July	8	78	10.3	0	2	0.0									
5 July	13	139	9.4												
11 July	11	122	9.0												
12 July	1	111	0.9												
13 July	7	114	6.1				1	1	100.0						
14 July	1	127	0.8	0	1	0.0									
15 July	15	130	11.5	0	1	0.0									
16 July	3	103	2.9												
17 July	5	105	4.8	0	1	0.0									
18 July	10	140	7.1				0	1	0.0						
19 July	4	104	3.8												
20 July	3	115	2.6	0	1	0.0									

Appendix Table 1. Continued.

Unit 7, Slot B

Test date	Subyearling chinook			Yearling chinook			Steelhead			Coho			Sockeye		
	Desc.	Catch	%	Desc.	Catch	%	Desc.	Catch	%	Desc.	Catch	%	Desc.	Catch	%
21 July	6	140	4.3	0	1	0.0									
22 July	2	122	1.6												
23 July	1	111	0.9												
24 July	6	50	12.0												
25 July	4	50	8.0	0	2	0.0	0	1	0.0						
26 July	4	35	11.4	1	2	50.0	0	4	0.0						

Appendix Table 2. Statistical analyses of mean descaling values for tests at McNary Dam, 1994. Asterisks indicate statistically significant differences between means.

Test dates	Species	Vertical barrier screen (VBS) comparison	Analysis source	Analysis type	Calculated test statistic (F)	df	P
			VBS1[a] vs. VBS2[b] vs. MBFVBS[c]				
18 - 30 April	Yearling chinook	Type	VBS type	RBANOVA[d]	0.29	2,71	0.751
2 - 5 May	Steelhead		VBS type	ANOVA[e]	0.50	2,63	0.608
13 - 31 May	Sockeye		VBS type	ANOVA	0.41	2,56	0.668
1 - 2 June							
			Polyester mesh vs. profile wire				
	Yearling chinook	Surface material	porosity[f]	2-RBANOVA[g]	4.48	1,26	0.044
			material	2-RBANOVA	0.84	1,26	0.367
			porosity vs. material	2-RBANOVA	0.59	1,26	0.449
	Steelhead		porosity	2-RBANOVA	0.67	1,18	0.432
			material	2-RBANOVA	<0.00	1,18	0.982
			porosity vs. material	2-RBANOVA	55.19*	1,18	<0.001
	Sockeye		material	RBANOVA	1.43	1,10	0.259
			Streamlined vs. standard				
	Yearling chinook	Streamlining	guidance screen	2-RBANOVA	4.90	1,24	0.037
			streamlining	2-RBANOVA	0.94	1,24	0.341
			guidance screen vs. streamlining	2-ANOVA[h]	0.02	1,24	0.884
	Steelhead		guidance screen	2-ANOVA	1.10	1,30	0.303
			streamlining	2-ANOVA	0.16	1,30	0.690
			guidance screen vs. streamlining	2-ANOVA	30.68*	1,30	<0.001
	Sockeye		streamlining	ANOVA	0.08	1,17	0.784
			VBS1 vs. VBS2 vs. MBFVBS				
20 - 30 June	Subyearling chinook	Type	VBS type, day	RBANOVA	1.87	2,50	0.164
1 July							
5 July							
11 - 26 July							

[a] Vertical barrier screen system 1.
[b] Vertical barrier screen system 2.
[c] Modified balanced-flow vertical barrier screen.
[d] Randomized block analysis of variance.
[e] Analysis of variance.
[f] Guidance screen porosity.
[g] Two factor nested randomized block analysis of variance.
[h] Two factor analysis of variance.

Appendix Table 2. Continued.

Test dates	Species	Vertical barrier screen (VBS) comparison	Analysis source	Analysis type	Calculated test statistic (F)	df	P
			<u>Polyester mesh vs. profile wire</u>				
20 - 30 June	Subyearling chinook	Surface material	porosity	2-RBANOVA	19.97	1,22	<0.001
1 July			material	2-RBANOVA	4.12	1,22	0.055
5 July			porosity vs. material	2-RBANOVA	1.36	1,22	0.257
11 - 26 July							
			<u>Streamlined vs. standard</u>				
	Subyearling chinook	Streamlining	guidance screen	2-RBANOVA	0.15	1,24	0.706
			streamlining	2-RBANOVA	0.11	1,24	0.740
			guidance screen vs. streamlining	2-RBANOVA	10.43*	1,24	0.004

Appendix Table 3. Numbers of fish caught, by species, for individual replicates of fish guidance efficiency (FGE) tests at McNary Dam, 1994.

22 April (5B, ESBS, VBS2)[a]

Location	Subyearling chinook				Yearling chinook				Steelhead				Coho				Sockeye			
	L	C	R	Tot[b]	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot
Level 1											1	1								
Level 2						1		1										1		1
Level 3						1	2	3		1		1								
Level 4											1	1								
Level 5							1		1		1	1								
Level 6					1			1	1		2	3								
Level 7																				
Net total					1	3	2	6	1	1	5	7						1		1
Gatewell								79				22								4
Total								85				29								5
FGE (%)								93				76								80

22 April (6B, ESBS, VBS1)

Location	Subyearling chinook				Yearling chinook				Steelhead				Coho				Sockeye			
	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot
Level 1																				
Level 2			1	1	1			1												
Level 3					1	1	1	3			1	1								
Level 4							1	1												
Level 5					2		2	4			1	1								
Level 6						1		1		1		1								
Level 7										1		1								
Net total			1	1	4	2	4	10		2	2	4								
Gatewell								77				12								2
Total				1				87				16								2
FGE (%)				0				89				75								100

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[a] Test date (test slot, guidance device type, vertical barrier screen type); ESBS = extended-length submersible bar screen, VBS1 = vertical barrier screen system 1, VBS2 = vertical barrier screen system 2.

[b] Refers to fyke-net column: L = left, C = center, R = right, Tot = total catch for net level.

Appendix Table 3. Continued.

23 April (5B, ESBS, VBS2)

Location	Subyearling chinook				Yearling chinook				Steelhead				Coho				Sockeye			
	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot
Level 1							1	1			1	1								
Level 2					1	1		2			1	1								
Level 3					1		3	4	1			1								
Level 4					1	2	1	4												
Level 5					3	2	4	9	2	1		3								
Level 6					1	4	5	10			1	1								
Level 7									1			1								
Net total					7	9	14	30	4	1	3	8								
Gatewell								263				77								20
Total								293				85								20
FGE (%)								90				91								100

23 April (6B, ESBS, VBS1)

Location	Subyearling chinook				Yearling chinook				Steelhead				Coho				Sockeye			
	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot
Level 1						1	1			1	1									
Level 2					2			2												
Level 3						1	2	3												
Level 4					1			1												
Level 5							2	2		1		1								
Level 6					1	1	3	5			1	1								
Level 7							1	1			1	1								
Net total					4	2	9	15		1	3	4								
Gatewell								219				75								18
Total								234				79								18
FGE (%)								94				94								100

Appendix Table 3. Continued.

25 April (5B, ESBS, VBS2)

Location	Subyearling chinook				Yearling chinook				Steelhead				Coho				Sockeye			
	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot
Level 1							1	1												
Level 2					1	1	1	3	1			3					1			1
Level 3						3		3	1			1								
Level 4					3	1	3	7	2	1	1	4						1		1
Level 5					4	1	3	8	2	2	2	6								
Level 6					2	2		4		2	2	4							2	2
Level 7																				
Net total					10	8	8	26	6	5	5	16					1	1	2	4
Gatewell								213				101								29
Total								239				117								33
FGE (%)								89				86								88

25 April (6B, ESBS, VBS1)

Location	Subyearling chinook				Yearling chinook				Steelhead				Coho				Sockeye			
	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot
Level 1					1			1												
Level 2																	1			1
Level 3					2	1	3	6			1	1								
Level 4					5		2	7		1	1	2					2			2
Level 5					2	4	2	8	4		1	5								
Level 6					3	4	1	8		3		3								
Level 7																		1		1
Net total					13	9	8	30	4	4	3	11					3	1		4
Gatewell								168				122				2				25
Total								198				133				2				29
FGE (%)								85				92				100				86

Appendix Table 3. Continued.

26 April (5B, ESBS, VBS2)

Location	Subyearling chinook				Yearling chinook				Steelhead				Coho				Sockeye			
	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot
Level 1						2		2			1	1							1	1
Level 2					1			1	1		1	2							1	1
Level 3						3	3	6			2	2								
Level 4					2	1	1	4	1	1	2	4							1	1
Level 5					2	1	2	5	1		2	3								
Level 6					1			1												
Level 7																				
Net total					6	7	6	19	3	1	8	12							3	3
Gatewell								75				84				1				28
Total								94				96				1				31
FGE (%)								80				88				100				90

26 April (6B, ESBS, VBS1)

Location	Subyearling chinook				Yearling chinook				Steelhead				Coho				Sockeye			
	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot
Level 1																				
Level 2					1	1	1	3	1		1	2					2			2
Level 3						1		1												
Level 4					1		2	3	1	2	2	5							1	1
Level 5			1	1	2	2		4	1		1	2					1			1
Level 6					1	3	2	6		1	1	2								
Level 7											2	2					1			1
Net total			1	1	5	7	5	17	3	3	7	13					4		1	5
Gatewell				1				62				80								16
Total				2				79				93								21
FGE (%)				50				79				86								76

Appendix Table 3. Continued.

27 April (5B, ESBS, VBS2)

Location	Subyearling chinook				Yearling chinook				Steelhead				Coho				Sockeye			
	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot
Level 1																				
Level 2					1		2	3												
Level 3							1	1												
Level 4							2	2										1		1
Level 5					1		1	2	1			1								
Level 6					1		1	2		2		2								
Level 7																				
Net total					3		7	10	1	2		3						1		1
Gatewell								76				49				2				12
Total								86				52				2				13
FGE (%)								88				94				100				92

27 April (6B, ESBS, VBS1)

Location	Subyearling chinook				Yearling chinook				Steelhead				Coho				Sockeye			
	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot
Level 1																				
Level 2					2			2	1		1	2								
Level 3					1	1	4	6		1		1								
Level 4					1	3	3	7	1		2	3					1		1	2
Level 5						1	3	4			2	2							1	1
Level 6					2		3	5			1	1							1	1
Level 7																				
Net total					6	5	13	24	2	1	6	9					1		3	4
Gatewell								79				96				2				7
Total								103				105				2				11
FGE (%)								77				91				100				64

Appendix Table 3. Continued.

28 April (5B, ESBS, VBS2)

Location	Subyearling chinook				Yearling chinook				Steelhead				Coho				Sockeye			
	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot
Level 1																				
Level 2					1	1		2	1			1						1	1	2
Level 3							1	1	1	1	1	3								
Level 4					1		1	2		1	1	2								
Level 5					1		2	3	1	1	1	3						1		1
Level 6						1	3	4	1		1	2								
Level 7																				
Net total					3	2	7	12	4	3	4	11						2	1	3
Gatewell								99				65				10				19
Total								111				76				10				22
FGE (%)								89				86				100				86

28 April (6B, ESBS, VBS1)

Location	Subyearling chinook				Yearling chinook				Steelhead				Coho				Sockeye			
	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot
Level 1									1			1								
Level 2					2			2											1	1
Level 3					1		1	2									1		2	3
Level 4					1	1	1	3	2		2	4								
Level 5					4	1	1	6	3	3	4	10					1			1
Level 6						1	2	3										1		1
Level 7																				
Net total					8	3	5	16	6	3	6	15					2	1	3	6
Gatewell								104				87								9
Total								120				102								15
FGE (%)								87				85								60

Appendix Table 3. Continued.

29 April (5B, ESBS, VBS2)

Location	Subyearling chinook				Yearling chinook				Steelhead				Coho				Sockeye			
	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot
Level 1																				
Level 2										1		1								
Level 3							1	1	2		1	3								
Level 4						1	3	4			2	2					1		1	2
Level 5					2	1	5	8	1	2	2	5					2	1	2	5
Level 6					1		2	3		1	1	2							2	2
Level 7					1	1		2	1		1	2								
Net total					4	3	11	18	4	4	7	15					3	1	5	9
Gatewell								93				44				1				54
Total								111				59				1				63
FGE (%)								84				75				100				86

29 April (6B, ESBS, VBS1)

Location	Subyearling chinook				Yearling chinook				Steelhead				Coho				Sockeye			
	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot
Level 1																				
Level 2						1		1			1	1					1	1	1	3
Level 3					1			1	1			1							1	1
Level 4					1	1	2	4	1	1	1	3					4	1	1	6
Level 5					1	3	5	9	1		1	2					2	1	2	5
Level 6					2	1		3			1	1						1	1	2
Level 7							1	1												
Net total					5	6	8	19	3	1	4	8					7	4	6	17
Gatewell								56				46								46
Total								75				54								63
FGE (%)								75				85								73

Appendix Table 3. Continued.

30 April (5B, ESBS, VBS2)

Location	Subyearling chinook				Yearling chinook				Steelhead				Coho				Sockeye			
	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot
Level 1											1	1								
Level 2							4	4									1	2	1	4
Level 3					1	1	1	3			1	1					1		4	5
Level 4					3	3		6	1			1					2	2	1	5
Level 5					1	5	1	7			1	1					1	7	2	10
Level 6					4	3	2	9	3	2	1	6					2	3	2	7
Level 7					1			1	1			1								
Net total					10	12	8	30	5	2	4	11					7	14	10	31
Gatewell				1				110				153				2				176
Total				1				140				164				2				207
FGE (%)				100				79				93				100				85

30 April (6B, ESBS, VBS1)

Location	Subyearling chinook				Yearling chinook				Steelhead				Coho				Sockeye			
	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot
Level 1					1			1												
Level 2			1	1			4	4									1	2	1	4
Level 3						3	3	6	1		1	2					1	1	3	5
Level 4					1	1	6	8			1	1					5	6	5	16
Level 5					5	2	4	11		3	1	4					3		1	4
Level 6					1	3	2	6									2	1	3	6
Level 7					2			2		1		1					2			2
Net total			1	1	10	9	19	38	1	4	3	8					14	10	13	37
Gatewell				1				121				146				1				134
Total				1				159				154				1				171
FGE (%)				0				76				95				100				78

Appendix Table 3. Continued.

2 May (5B, ESBS, VBS2)

Location	Subyearling chinook				Yearling chinook				Steelhead				Coho				Sockeye			
	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot
Level 1										1	1	2							1	1
Level 2					3	1	3	7		1	4	5					1	2	3	6
Level 3					2		1	3	1		1	2					1	4	4	9
Level 4					2	2	2	6			1	1						4	1	5
Level 5					5	5	3	13	2	1		3					6	5	3	14
Level 6					2	3	4	9	2		3	5					2	6	3	11
Level 7					1			1			1	1								
Net total					15	11	13	39	5	3	11	19					10	21	15	46
Gatewell								204				130				1				280
Total								243				149				1				326
FGE (%)								84				87				100				86

2 May (6B, ESBS, VBS1)

Location	Subyearling chinook				Yearling chinook				Steelhead				Coho				Sockeye			
	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot
Level 1																				
Level 2							4	4									6	1	6	13
Level 3					2	2	2	6	2			2					7	2	10	19
Level 4					5	1	5	11		2	4	6					11	5	13	29
Level 5					11	6	4	21	2	1		3					9	11	14	34
Level 6					9	3		12									2	5	9	16
Level 7																	1			1
Net total					27	12	15	54	4	3	4	11					36	24	52	112
Gatewell				4				188				130								299
Total				4				242				141								411
FGE (%)				100				78				92								73

Appendix Table 3. Continued.

3 May (5B, ESBS, VBS2)

Location	Subyearling chinook				Yearling chinook				Steelhead				Coho				Sockeye			
	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot
Level 1																				
Level 2							1	1	2		1	3					1		6	7
Level 3							1	1	1			1					1	1	4	6
Level 4						1	1	2	1			1					1	2	5	8
Level 5					2	2	2	6	1	3	3	7					2			2
Level 6						2	2	4	1	1		2						1	1	2
Level 7							1	1			1	1								
Net total					2	5	8	15	6	4	5	15					5	4	16	25
Gatewell								185				61				3				254
Total								200				76								279
FGE (%)								93				80				100				91

3 May (6B, ESBS, VBS1)

Location	Subyearling chinook				Yearling chinook				Steelhead				Coho				Sockeye			
	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot
Level 1																				
Level 2						2	1	3			1	1							5	5
Level 3					3		1	4			1	1					4	1	4	9
Level 4							3	3									4	3	9	16
Level 5					6	1	4	11	3	1		4					5	1	1	7
Level 6					8	1	4	13	1	1	1	3						3	5	8
Level 7									1			1					1			1
Net total					17	4	13	34	5	2	3	10					14	8	24	46
Gatewell								163				62				1				177
Total								197				72				1				223
FGE (%)																				

Appendix Table 3. Continued.

4 May (5B, ESBS, VBS2)

Location	Subyearling chinook				Yearling chinook				Steelhead				Coho				Sockeye			
	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot
Level 1							1	1			1	1					3	3	3	9
Level 2					3	1	2	6									19	7	16	42
Level 3					1	1	1	3	1	4	1	6					14	12	14	40
Level 4						1	1	2			3	3					25	18	35	78
Level 5					3	2	2	7	1		2	3					22	36	29	87
Level 6					1	3	3	7									7	26	21	54
Level 7					1		1	2			1	1					2		4	6
Net total					9	8	11	28	2	4	8	14					92	102	122	316
Gatewell				2				236				135				15				1036
Total				2				264				149				15				1352
FGE (%)				100				89				91				100				77

4 May (6B, ESBS, VBS1)

Location	Subyearling chinook				Yearling chinook				Steelhead				Coho				Sockeye			
	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot
Level 1																				
Level 2						5		5	2			2					20		24	44
Level 3					2	2	2	6	1		1	2					22	17	23	67
Level 4					3	1		4									38	35	66	139
Level 5					3	1	5	9	3	2		5					28	27	41	96
Level 6							1	1	1			1					28	15	26	69
Level 7									1	2		3						3	1	4
Net total					8	9	8	25	8	4	1	13					136	97	186	419
Gatewell								138				98				8				949
Total								163				111				8				1368
FGE (%)								85				88				100				69

Appendix Table 3. Continued.

13 May (5B, ESBS, VBS2)

Location	Subyearling chinook				Yearling chinook				Steelhead				Coho				Sockeye			
	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot
Level 1											1	1								
Level 2					3		2	5									1			1
Level 3					1		1	2												
Level 4						1	2	3										3		3
Level 5					2	4	1	7			1	1					1	1		2
Level 6					1	2	3	6		1		1							1	1
Level 7						1	1	2						1		1				
Net total					7	8	10	25	0	1	2	3		1		1	2	4	1	7
Gatewell				2				301				19				93				39
Total				2				326				22				94				46
FGE (%)				100				92				86				99				85

13 May (6B, ESBS, VBS1)

Location	Subyearling chinook				Yearling chinook				Steelhead				Coho				Sockeye			
	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot
Level 1																	1			1
Level 2					2		2	4									1			1
Level 3			1	1	3	1	5	9		1		1					1		1	2
Level 4							5	5	2			2								
Level 5					5	1	3	9									1			1
Level 6					2			2			1	1							4	4
Level 7																		1		1
Net total			1	1	12	2	15	29	2	1	1	4					4	1	5	10
Gatewell				1				273				5				121				31
Total				2				302				9				121				41
FGE (%)				50				90				56				100				76

Appendix Table 3. Continued.

14 May (5B, ESBS, VBS2)

Location	Subyearling chinook				Yearling chinook				Steelhead				Coho				Sockeye			
	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot
Level 1																				
Level 2							4	4									1		3	4
Level 3					2		7	9									1		1	2
Level 4					2	1	4	7									2	1	2	5
Level 5					4	8	1	13									1	2		3
Level 6					3	3	3	9			1	1							1	1
Level 7																				
Net total					11	12	19	42			1	1					5	3	7	15
Gatewell				1				344				24				39				71
Total				1				386				25				39				86
FGE (%)				100				89				96				100				83

14 May (6B, ESBS, VBS1)

Location	Subyearling chinook				Yearling chinook				Steelhead				Coho				Sockeye			
	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot
Level 1										1		1								
Level 2					5		5	10												
Level 3					1	1	2	4									2	2		4
Level 4						2	2	4									4	3	5	12
Level 5					2		6	8										2	3	5
Level 6					1	2	3	6									1			1
Level 7																				
Net total					9	5	18	32		1		1					7	7	8	22
Gatewell								221				29				32				45
Total								253				30				32				67
FGE (%)								87				97				100				67

Appendix Table 3. Continued.

16 May (5B, ESBS, VBS2)

Location	Subyearling chinook				Yearling chinook				Steelhead				Coho				Sockeye			
	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot
Level 1																				
Level 2							1	1									1	1		2
Level 3																				
Level 4					1			1									1			1
Level 5					2	2		4									1	1		2
Level 6																		1		1
Level 7																				
Net total					3	2	1	6									3	3		6
Gatewell								40				3				5				7
Total								46				3				5				13
FGE (%)								87				100				100				54

16 May (6B, ESBS, VBS1)

Location	Subyearling chinook				Yearling chinook				Steelhead				Coho				Sockeye			
	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot
Level 1																		1		1
Level 2							1	1												
Level 3						1	2	3									1	1		2
Level 4						2	2	4							1	1	2		2	4
Level 5			1	1		1		1											1	1
Level 6					1	1	1	3									1			1
Level 7		1		1			1	1												
Net total		1	1	2	1	5	7	13							1	1	4	2	3	9
Gatewell								71				4				18				18
Total				2				84				4				19				27
FGE (%)				0				85				100				95				67

Appendix Table 3. Continued.

17 May (5B, ESBS, VBS2)

Location	Subyearling chinook				Yearling chinook				Steelhead				Coho				Sockeye			
	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot
Level 1							1	1											3	3
Level 2					2	1	2	5									1	3	3	7
Level 3					1		9	10							1	1	4	1	2	7
Level 4					6	3	6	15									8	5	10	23
Level 5					6	6	7	19					2			2	8	7	8	23
Level 6					3	1	3										4	3	1	8
Level 7						1		1									1			1
Net total					18	12	28	58					2		1	3	26	19	27	72
Gatewell								492				73				53				131
Total								550				73				56				203
FGE (%)								90				100				95				65

17 May (6B, ESBS, VBS1)

Location	Subyearling chinook				Yearling chinook				Steelhead				Coho				Sockeye			
	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot
Level 1																				
Level 2	1			1	1			1		1		1					4	1	4	9
Level 3						2	4	6	1		1	2					7	2	4	13
Level 4					4	2	12	18			1	1					3	9	10	22
Level 5					2	8	5	15					1			1	8	8	12	28
Level 6					3	4	3	10	1			1						4	6	10
Level 7						1		1									1	1	1	3
Net total	1			1	10	17	24	51	2	1	2	5	1			1	23	25	37	85
Gatewell								223				29				25				137
Total				1				274				34				26				222
FGE (%)				0				81				85				96				62

Appendix Table 3. Continued.

18 May (5B, ESBS, VBS2)

Location	Subyearling chinook				Yearling chinook				Steelhead				Coho				Sockeye			
	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot
Level 1					2			2	1			1					1		2	3
Level 2					2	2	3	7			1	1					2			2
Level 3					1	2	1	4	1	1	1	3					3	1	6	10
Level 4					3	1	5	9	1	1	2	4					3	2	3	8
Level 5			1	1	4	7	2	13	2	1	1	4					3	1	6	10
Level 6					3	2	2	7	1			1	1	1		2	2	4	1	7
Level 7										1		1							1	1
Net total			1	1	15	14	13	42	6	4	5	15	1	1		2	14	8	19	41
Gatewell				12				553				119				31				183
Total				13				595				134				33				224
FGE (%)				92				93				89				93				82

18 May (6B, ESBS, VBS1)

Location	Subyearling chinook				Yearling chinook				Steelhead				Coho				Sockeye			
	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot
Level 1					1			1											1	1
Level 2						1	2	3	1			1					3	1	6	10
Level 3					6		2	8	1			1					5	2	3	10
Level 4					3	2	4	9			2	2			1	1	6	6	11	23
Level 5	1			1	1	5	5	11			1	1					5	4	4	13
Level 6					1	3	2	6	1		1	2			1	1	1	2	3	6
Level 7						1	1	2									3	1		4
Net total	1			1	12	12	16	40	3		4	7			2	2	23	16	28	67
Gatewell				7				291				162				21				186
Total				8				331				169				23				253
FGE (%)				88				88				96				91				74

Appendix Table 3. Continued.

19 May (5B, ESBS, VBS2)

Location	Subyearling chinook				Yearling chinook				Steelhead				Coho				Sockeye			
	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot
Level 1																		1		1
Level 2					5	1	2	8												
Level 3					1	2	5	8										2	1	3
Level 4			1	1	4	3	10	17									4	5	5	14
Level 5					7	8	7	22			1	1					5	3	5	13
Level 6	1			1	2	6	3	11									2	2	4	8
Level 7						1		1		1	1	2					1	2		3
Net total	1		1	2	19	21	27	67		1	2	3					12	15	15	42
Gatewell				10				535				34				7				162
Total				12				602				37				7				204
FGE (%)				83				89				92				100				79

19 May (6B, ESBS, VBS1)

Location	Subyearling chinook				Yearling chinook				Steelhead				Coho				Sockeye			
	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot
Level 1										1		1								
Level 2					1			1										1	3	4
Level 3						1	3	4									2	1	1	4
Level 4						2	6	8			1	1					3	7	9	19
Level 5					1	4		5	1			1					3	6	5	14
Level 6						1		1									2	3	3	8
Level 7							1	1									2			2
Net total					2	8	10	20	1	1	1	3					12	18	21	51
Gatewell				7				198				16				8				114
Total				7				218				19				8				165
FGE (%)				100				91				84				100				69

Appendix Table 3. Continued.

20 May (5B, ESBS, VBS2)

Location	Subyearling chinook				Yearling chinook				Steelhead				Coho				Sockeye			
	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot
Level 1																			1	1
Level 2					3	1	5	9									2	1	3	6
Level 3			1	1	3		3	6									1	3		4
Level 4					4	3	4	11	1			1					3		5	8
Level 5					2	2	3	7		1	1	2					2	1		3
Level 6					4	1	2	7			1	1					1	1		2
Level 7																	2		1	3
Net total			1	1	16	7	17	40	1	1	2	4					11	6	10	27
Gatewell				9				403				16				17				67
Total				10				443				20				17				94
FGE (%)				90				91				80				100				71

20 May (6B, ESBS, VBS1)

Location	Subyearling chinook				Yearling chinook				Steelhead				Coho				Sockeye			
	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot
Level 1																		1		1
Level 2						1	2	3	1			1					3		1	4
Level 3		1		1		1	2	3			1	1					3	4	2	9
Level 4					2	1	1	4										1	6	7
Level 5					1	1		2									6		1	7
Level 6						1		1			1	1					2	2	3	7
Level 7																			1	1
Net total		1		1	3	5	5	13	1		2	3					14	8	14	36
Gatewell				2				116				8				2				37
Total				3				129				11				2				73
FGE (%)				67				90				73				100				51

Appendix Table 3. Continued.

21 May (5B, ESBS, VBS2)

Location	Subyearling chinook				Yearling chinook				Steelhead				Coho				Sockeye			
	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot
Level 1																				
Level 2					5		2	7												
Level 3					1		3	4											1	1
Level 4					1		1	2												
Level 5					1	1	1	3												
Level 6					1			1									2		1	3
Level 7																	1			1
Net total					9	1	7	17									3		2	5
Gatewell				1				120				9				1				21
Total				1				137				9				1				26
FGE (%)				100				88				100				100				81

21 May (6B, ESBS, VBS1)

Location	Subyearling chinook				Yearling chinook				Steelhead				Coho				Sockeye			
	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot
Level 1																				
Level 2							1	1										1	3	4
Level 3						1	1	2									1			1
Level 4							2	2									1		1	2
Level 5																	1			1
Level 6																				
Level 7																				
Net total						1	4	5									3	1	4	8
Gatewell				5				76				9				1				19
Total				5				81				9				1				27
FGE (%)				100				94				100				100				70

Appendix Table 3. Continued.

23 May (5B, ESBS, VBS2)

Location	Subyearling chinook				Yearling chinook				Steelhead				Coho				Sockeye			
	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot
Level 1																	1			1
Level 2					1		1	2											1	1
Level 3											1	1					2		1	3
Level 4							1	1									3			3
Level 5									1			1					2		5	7
Level 6																		7	4	11
Level 7					1			1										1		1
Net total					2		2	4	1		1	2					8	8	11	27
Gatewell				5				91				42				4				127
Total				5				95				44				4				154
FGE (%)				100				96				96				100				83

23 May (6B, ESBS, VBS1)

Location	Subyearling chinook				Yearling chinook				Steelhead				Coho				Sockeye			
	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot
Level 1																	1			1
Level 2						1		1			1	1					3		6	9
Level 3		1		1	1		2	3	1			1					4	1	7	12
Level 4					2		1	3									6	2	8	16
Level 5					1			1									4	3	7	14
Level 6						1		1									2	2	1	5
Level 7																		1	1	2
Net total		1		1	4	2	3	9	1		1	2					20	9	30	59
Gatewell				8				97				44				11				264
Total				9				106				46				11				323
FGE (%)				89				92				96				100				82

Appendix Table 3. Continued.

24 May (5B, ESBS, VBS2)

Location	Subyearling chinook				Yearling chinook				Steelhead				Coho				Sockeye			
	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot
Level 1																			1	1
Level 2					2		1	3										2	1	3
Level 3																	1			1
Level 4							1	1									1	2	2	5
Level 5																		2	1	3
Level 6							1	1										2	1	3
Level 7																	1			1
Net total					2		3	5									3	8	7	18
Gatewell				5				90				17				7				66
Total				5				95				17				7				84
FGE (%)				100				95				100				100				79

24 May (6B, ESBS, VBS1)

Location	Subyearling chinook				Yearling chinook				Steelhead				Coho				Sockeye			
	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot
Level 1																				
Level 2																	1		2	3
Level 3							1	1									2			2
Level 4									1		1	2					1		2	3
Level 5																	1	1	1	3
Level 6																	3			3
Level 7																		2	1	3
Net total							1	1	1		1	2					8	3	6	17
Gatewell								27				10								96
Total								28				12								113
FGE (%)								96				83								85

Appendix Table 3. Continued.

25 May (5B, ESBS, VBS2)

Location	Subyearling chinook				Yearling chinook				Steelhead				Coho				Sockeye			
	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot
Level 1																			1	1
Level 2					2	1	1	4									3	1		4
Level 3							1	1									5	2	3	10
Level 4					4	1	2	7									5	5	6	16
Level 5					8	3	5	16									7	7	7	21
Level 6						1	2	3	1			1					3	4	3	10
Level 7																				
Net total					14	6	11	31	1			1					23	19	20	62
Gatewell				5				142				103				5				149
Total				5				173				104				5				211
FGE (%)				100				82				99				100				71

25 May (6B, ESBS, VBS1)

Location	Subyearling chinook				Yearling chinook				Steelhead				Coho				Sockeye			
	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot
Level 1																			1	1
Level 2					1		1	2									1	1	2	4
Level 3					1		4	5	1			1					4	3	13	20
Level 4					3		4	7	1		1	2					12	8	8	28
Level 5					5	3	6	14	1	2		3					14	3	5	32
Level 6					2		2	4									9	7		16
Level 7					1	1		2												
Net total					13	4	12	34	3	2	1	6					40	15	29	84
Gatewell				2				81				65				4				133
Total				2				115				71				4				217
FGE (%)				100				70				92				100				61

Appendix Table 3. Continued.

26 May (5B, ESBS, VBS2)

Location	Subyearling chinook				Yearling chinook				Steelhead				Coho				Sockeye			
	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot
Level 1					1			1							4	4				
Level 2					5	1	5	11									12	2	9	23
Level 3					3	3	4	10	1	1	1	3					11	7	22	40
Level 4					6	5	4	15		1	3	4					31	21	24	76
Level 5					13	12	15	40	1		1	2					33	29	21	83
Level 6	1			1	4	5	4	13	1	1		2					11	6	6	23
Level 7					1			1									1	4	1	6
Net total	1			1	33	26	32	91	3	3	5	11					99	69	87	225
Gatewell				6				441				206				10				339
Total				7				532				217				10				564
FGE (%)				86				83				95				100				61

26 May (6B, ESBS, VBS1)

Location	Subyearling chinook				Yearling chinook				Steelhead				Coho				Sockeye			
	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot
Level 1						1		1									2	1		3
Level 2					3	1	3	7									9	2	14	25
Level 3					5	2	6	13	1			1					21	15	26	62
Level 4					6	2	8	16		1	1	2					22	49	31	102
Level 5					6	4	10	20	3	2	1	6					26	33	37	96
Level 6					3	3	7	13	1	1	2	4					13	8	13	34
Level 7							1	1									1	1	4	
Net total					21	13	35	71	5	4	4	13					94	109	125	328
Gatewell								299				141				13				364
Total								370				154				13				692
FGE (%)								81				92				100				53

Appendix Table 3. Continued.

27 May (5B, ESBS, VBS2)

Location	Subyearling chinook				Yearling chinook				Steelhead				Coho				Sockeye			
	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot
Level 1							1	1												
Level 2					1		1	2	1		2	3					3	1	5	9
Level 3							2	2			1	1					1	1	8	10
Level 4							2	2									4	7	8	19
Level 5					3	1	2	6	1			1					6	3	2	11
Level 6							1	1									2	1	1	4
Level 7											1	1								
Net total					4	3	7	14	2		4	6					16	13	24	53
Gatewell				6				196				83				1				177
Total				6				210				89				1				230
FGE (%)				100				93				93				100				77

27 May (6B, ESBS, VBS1)

Location	Subyearling chinook				Yearling chinook				Steelhead				Coho				Sockeye			
	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot
Level 1																				
Level 2					1			1									4		4	8
Level 3							1	1									1		1	2
Level 4							2	2									1	5	5	11
Level 5					1	1	1	3	1		1	2					3	1	4	8
Level 6					2		1	3									2		1	3
Level 7																	1			1
Net total					4	1	5	10	1		1	2					12	6	25	43
Gatewell				3				171				61				3				152
Total				3				181				63				3				195
FGE (%)				100				95				97				100				78

Appendix Table 3. Continued.

30 May (5B, ESBS, VBS2)

Location	Subyearling chinook				Yearling chinook				Steelhead				Coho				Sockeye			
	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot
Level 1																				
Level 2					1			1	1			1								
Level 3					1			1									2		2	4
Level 4																	1		2	3
Level 5					1	1		2	1			1					1		1	2
Level 6						1		1										1	3	4
Level 7																				
Net total					3	2		5	2			2					4	1	8	13
Gatewell				4				157				135				1				104
Total				4				162				137				1				117
FGE (%)				100				97				99				100				89

30 May (6B, ESBS, VBS1)

Location	Subyearling chinook				Yearling chinook				Steelhead				Coho				Sockeye			
	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot
Level 1																		1		1
Level 2							1	1									3	1	2	6
Level 3							1	1		4		4					4	1	3	8
Level 4									1			1					3	3	4	10
Level 5						1	3	4									1	1	3	5
Level 6							2	2			1	1						1	2	3
Level 7																	1	1	1	3
Net total						1	7	8	1	4	1	6					12	10	14	36
Gatewell				8				143				133				4				106
Total				8				151				139				4				142
FGE (%)				100				95				96				100				75

Appendix Table 3. Continued.

31 May (5B, ESBS, VBS2)

Location	Subyearling chinook				Yearling chinook				Steelhead				Coho				Sockeye			
	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot
Level 1						1	1	2												
Level 2					1	1	1	3									3		1	4
Level 3							4	4									2		1	3
Level 4					1	1	2	4	3		1	4					1	3	4	8
Level 5	1			1	2		2	4	2			2					1	2		3
Level 6						2	1	3										1	2	3
Level 7						1		1			1	1								
Net total	1			1	4	6	11	21	5		2	7					7	6	8	21
Gatewell				10				138				130				3				104
Total				11				159				137				3				125
FGE (%)				91				87				95				100				83

31 May (6B, ESBS, VBS1)

Location	Subyearling chinook				Yearling chinook				Steelhead				Coho				Sockeye			
	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot
Level 1																				
Level 2							1	1									2	1	3	6
Level 3					1	2	1	4	1	1		2					5	1	3	9
Level 4		1		1			2	2									4	2	3	9
Level 5					3	1	2	6			1	1					3	2	2	7
Level 6		1		1	3	1		4									2			2
Level 7					1			1	1			1								
Net total		2		2	8	4	6	18	2	1	1	4					16	6	11	33
Gatewell				10				64				61				1				36
Total				12				82				65				1				69
FGE (%)				83				78				94				100				52

Appendix Table 3. Continued.

1 June (5B, ESBS, VBS2)

Location	Subyearling chinook				Yearling chinook				Steelhead				Coho				Sockeye			
	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot
Level 1							1	1												
Level 2							1	1									1	1		2
Level 3					1			1									2	1	3	6
Level 4					1	2	2	5	1		1	2					2	1	2	5
Level 5						1	1	2	1		1	2					3	4	3	10
Level 6					2	1	1	4		1		1						2		2
Level 7																				
Net total					4	4	6	14	2	1	2	5					8	9	8	25
Gatewell				1				125				125				1				83
Total				1				139				130				1				108
FGE (%)				100				90				96				100				77

1 June (6B, ESBS, VBS1)

Location	Subyearling chinook				Yearling chinook				Steelhead				Coho				Sockeye			
	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot
Level 1																				
Level 2					1	1		2									2		3	5
Level 3						1	1	2		1		1					4	2	1	7
Level 4					2	1	2	5									1	4	8	13
Level 5						2	1	3	1	1		2					7	8	4	19
Level 6					2			2										1		1
Level 7																				
Net total					5	5	4	14	1	2		3					14	15	16	45
Gatewell				5				90				86								102
Total				15				104				89								147
FGE (%)				100				87				97								69

Appendix Table 3. Continued.

2 June (5B, ESBS, VBS2)

Location	Subyearling chinook				Yearling chinook				Steelhead				Coho				Sockeye			
	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot
Level 1																				
Level 2					1			1		1	1	2					2		1	3
Level 3						1		1			1	1						1	2	3
Level 4					1	2	1	4			1	1					2	2	3	7
Level 5					1	1	3	5	1	1		2					1	1	4	6
Level 6						2	3	5	1	2		3						1	1	2
Level 7																				
Net total					3	6	7	16	2	4	3	9					5	5	11	21
Gatewell				12				103				222				1				51
Total				12				119				231				1				72
FGE (%)				100				87				96				100				71

2 June (6B, ESBS, VBS1)

Location	Subyearling chinook				Yearling chinook				Steelhead				Coho				Sockeye			
	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot
Level 1																				
Level 2											1	1							1	1
Level 3							3	3		1	2	3							2	2
Level 4					2	1	2	5	2			2					1	2	2	5
Level 5					2			2	1			1					3		3	6
Level 6					3			3									1			1
Level 7																				
Net total					7	1	5	13	3	1	3	7					5	2	8	15
Gatewell				8				125				162				1				49
Total				8				138				169				1				64
FGE (%)				100				91				96				100				77

Appendix Table 3. Continued.

20 June (5B, ESBS, VBS2)

Location	Subyearling chinook				Yearling chinook				Steelhead				Coho				Sockeye			
	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot
Level 1																				
Level 2	7	3	6	16																
Level 3	12	2	9	23	2			2												
Level 4	16	18	19	53	1		2	3										1		1
Level 5	18	23	19	60			5	5	1			1					1			1
Level 6	6	8	5	19			1	1												
Level 7	1			1																
Net total	60	54	58	172	3		8	11	1			1					1	1		2
Gatewell				388				34				32								9
Total				560				45				33								11
FGE (%)				69				76				97								82

20 June (6B, ESBS, VBS1)

Location	Subyearling chinook				Yearling chinook				Steelhead				Coho				Sockeye			
	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot
Level 1	1			1																
Level 2	3	1	2	6			1	1												
Level 3	3	9	5	17																
Level 4	11	5	8	24																
Level 5	8	4	10	22	1	2		3												
Level 6	2	1	5	8															1	1
Level 7	1	1	1	3																
Net total	29	21	31	81	1	2	1	4											1	1
Gatewell				254				11				7								2
Total				335				15				7								3
FGE (%)				76				73				100								67

Appendix Table 3. Continued.

21 June (5B, ESBS, VBS2)

Location	Subyearling chinook				Yearling chinook				Steelhead				Coho				Sockeye			
	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot
Level 1																				
Level 2	1	1	7	9		1	1	2											1	1
Level 3	5	2	6	13							1	1								
Level 4	2	1	1	4																
Level 5	9	6	6	21	1	1	1	3												
Level 6	3	1		4			1	1												
Level 7																				
Net total	20	11	20	51	1	2	3	6			1	1							1	1
Gatewell	254	25	13		8															
Total	305	31	14		9															
FGE (%)	83	81	93		89															

21 June (6B, ESBS, VBS1)

Location	Subyearling chinook				Yearling chinook				Steelhead				Coho				Sockeye			
	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot
Level 1																				
Level 2	2	3	1	6																
Level 3	2	1	3	6																
Level 4	1	4		5	1			1												
Level 5	3	2	3	8	1	1		2		1		1								
Level 6			3	3																
Level 7																				
Net total	8	10	10	28	2	1		3		1		1								
Gatewell				135				17				4								1
Total				163				20				5								1
FGE (%)				83				85				80								100

Appendix Table 3. Continued.

23 June (5B, ESBS, VBS2)

Location	Subyearling chinook				Yearling chinook				Steelhead				Coho				Sockeye			
	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot
Level 1	1		1	2																
Level 2	1	2	9	12																
Level 3	2	2	9	13																
Level 4	6	6	9	21																
Level 5	6	3	9	18																
Level 6	1	1	1	3			1	1												
Level 7	1			1																
Net total	18	14	38	70			1	1												
Gatewell				357				0												
Total				427				1												
FGE (%)				84				0												

23 June (6B, ESBS, VBS1)

Location	Subyearling chinook				Yearling chinook				Steelhead				Coho				Sockeye			
	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot
Level 1																				
Level 2	1		6	7																
Level 3	4	3	6	13																
Level 4	5	10	8	23																
Level 5	4	1	8	13																
Level 6			5	5																
Level 7			1	1																
Net total	14	14	34	62																
Gatewell				275				1												
Total				337				1												
FGE (%)				82				100												

Appendix Table 3. Continued.

24 June (5B, ESBS, VBS2)

Location	Subyearling chinook				Yearling chinook				Steelhead				Coho				Sockeye			
	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot
Level 1		1		1																
Level 2	7	4	4	15																
Level 3	11	6	8	25																
Level 4	11	9	7	27																
Level 5	4	12	11	27																
Level 6	5		3	8																
Level 7	1			1																
Net total	39	32	33	104																
Gatewell				500				14				10								1
Total				604				14				10								1
FGE (%)				83				100				100								100

24 June (6B, ESBS, VBS1)

Location	Subyearling chinook				Yearling chinook				Steelhead				Coho				Sockeye			
	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot
Level 1		1		1																
Level 2	2	3	3	8																
Level 3	4	2	1	7	1	1		2												
Level 4	6	4	5	15																
Level 5	8	8	4	20																
Level 6	1		5	6																
Level 7																				
Net total	21	18	18	57	1	1		2												
Gatewell				313				8												
Total				370				10												
FGE (%)				85				80												

Appendix Table 3. Continued.

27 June (5B, ESBS, VBS2)

Location	Subyearling chinook				Yearling chinook				Steelhead				Coho				Sockeye			
	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot
Level 1		1	4	5																
Level 2	4	4	10	18	2			2												
Level 3	5	2	11	18																
Level 4	5	3	13	21																
Level 5	16	8	9	33																
Level 6	2	1	2	5		1	1	2												
Level 7		1		1																
Net total	32	20	49	101	2	1	1	4												
Gatewell				556				27				1								6
Total				357				31				1								6
FGE (%)				85				87				100								100

27 June (6B, ESBS, VBS1)

Location	Subyearling chinook				Yearling chinook				Steelhead				Coho				Sockeye			
	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot
Level 1			1	1																
Level 2	2	3	5	10																
Level 3	4	2	2	8																
Level 4	4	4	5	13		1		1												
Level 5	7	5	9	21		1		1												
Level 6	2		1	3																
Level 7																				
Net total	19	14	23	56		2		2												
Gatewell				303				12				1								
Total				359				14				1								
FGE (%)				84				86				100								

Appendix Table 3. Continued.

28 June (5B, ESBS, VBS2)

Location	Subyearling chinook				Yearling chinook				Steelhead				Coho				Sockeye			
	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot
Level 1	2	2	1	5																
Level 2	16	5	13	34																
Level 3	11	2	10	23																
Level 4	5	9	8	22	1			1												
Level 5	7	10	14	31			1	1												
Level 6	1	1	2	4																
Level 7																				
Net total	42	29	48	119	1		1	2												
Gatewell				617				20				1								
Total				736				22				1								
FGE (%)				84				91				100								

28 June (6B, ESBS, VBS1)

Location	Subyearling chinook				Yearling chinook				Steelhead				Coho				Sockeye			
	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot
Level 1	1		1	2																
Level 2	3	2	9	14		1		1												
Level 3	3	2	3	8																
Level 4	3	2	8	13																
Level 5	5	4	9	18																
Level 6	3	2	1	6			1	1												
Level 7																				
Net total	18	12	31	61		1	1	2												
Gatewell				367				3												
Total				428				5												
FGE (%)				86				60												

Appendix Table 3. Continued.

29 June (5B, ESBS, VBS2)

Location	Subyearling chinook				Yearling chinook				Steelhead				Coho				Sockeye			
	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot
Level 1			2	2																
Level 2	15	9	30	54					1			1								
Level 3	5	16	25	46																
Level 4	22	11	24	57																
Level 5	28	31	26	85	1			1												
Level 6	7	1	3	11																
Level 7	1			1																
Net total	78	68	110	256	1			1	1			1								
Gatewell				1208				9				3								
Total				83				90				75								
FGE (%)																				

29 June (6B, ESBS, VBS1)

Location	Subyearling chinook				Yearling chinook				Steelhead				Coho				Sockeye			
	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot
Level 1		1		1																
Level 2	4	1	4	9																
Level 3	3	2	4	9																
Level 4	4	9	6	19																
Level 5	2	5	12	19																
Level 6	1	2	3	6																
Level 7	1																			
Net total	15	20	29	64																
Gatewell				351				2												
Total				415				2												
FGE (%)				85				100												

Appendix Table 3. Continued.

30 June (5B, ESBS, VBS2)

Location	Subyearling chinook				Yearling chinook				Steelhead				Coho				Sockeye			
	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot
Level 1	3	4	5	12																
Level 2	23	21	52	106																
Level 3	17	9	23	49																
Level 4	15	11	27	53		1		1												
Level 5	27	30	24	81	2	1	1	4												
Level 6	2	5	2	9																
Level 7	1	2	3	6																
Net total	98	82	136	316	2	2	1	5												
Gatewell				1682				44												
Total				1998				49												
FGE (%)				84				90												

30 June (6B, ESBS, VBS1)

Location	Subyearling chinook				Yearling chinook				Steelhead				Coho				Sockeye			
	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot
Level 1																				
Level 2	8	2	6	16																
Level 3	4	3	6	13																
Level 4	6	8	10	24	1			1												
Level 5	10	8	10	28																
Level 6	3	2	6	11																
Level 7		1	1	2																
Net total	31	24	39	94	1	1		2												
Gatewell				274				4												
Total				368				6												
FGE (%)				75				67												

Appendix Table 3. Continued.

1 July (5B, ESBS, VBS2)

Location	Subyearling chinook				Yearling chinook				Steelhead				Coho				Sockeye			
	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot
Level 1			1	1																
Level 2	2	2		4																
Level 3	3		3	6																
Level 4	4	2	3	9																
Level 5	9	6	4	19																
Level 6	4		3	7																
Level 7																				
Net total	22	10	14	46																
Gatewell				67								2								
Total				59								100								
FGE (%)																				

1 July (6B, ESBS, VBS1)

Location	Subyearling chinook				Yearling chinook				Steelhead				Coho				Sockeye			
	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot
Level 1	1			1																
Level 2		1	2	3																
Level 3	1	3	9	13			1	1												
Level 4	3	4	1	8																
Level 5	6	5	8	19		1	1	2												
Level 6	1	1		2																
Level 7																				
Net total	12	14	20	46		1	2	3												
Gatewell				107				3				1								
Total				153				6				1								
FGE (%)				70				50				100								

Appendix Table 3. Continued.

5 July (5B, ESBS, VBS2)

Location	Subyearling chinook				Yearling chinook				Steelhead				Coho				Sockeye			
	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot
Level 1	7	3	14	24	1			1												
Level 2	57	35	92	184																
Level 3	41	35	78	154																
Level 4	85	59	100	244																
Level 5	85	77	93	255																
Level 6	28	22	23	83																
Level 7	1		2	3																
Net total	304	231	412	947	1			1												
Gatewell				3612				4												
Total				4559				5												
FGE (%)				79				80												

5 July (6B, ESBS, VBS1)

Location	Subyearling chinook				Yearling chinook				Steelhead				Coho				Sockeye			
	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot
Level 1	2		1	3																
Level 2	27	16	52	95																
Level 3	24	21	53	98																
Level 4	49	50	61	160																
Level 5	49	35	62	146																
Level 6	14	9	13	36																
Level 7	2	1	1	4																
Net total	167	132	243	542																
Gatewell				1707				4												
Total				2249				4												
FGE (%)				76				100												

Appendix Table 3. Continued.

11 July (5B, ESBS, VBS2)

Location	Subyearling chinook				Yearling chinook				Steelhead				Coho				Sockeye			
	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot
Level 1		1	1	2																
Level 2	6	5	13	24																
Level 3	13	8	12	33																
Level 4	25	18	20	43																
Level 5	33	44	35	112																
Level 6	11	13	11	35		1		1												
Level 7	2			2																
Net total	70	89	92	251		1		1												
Gatewell				446				1												
Total				697				2												
FGE (%)				64				50												

11 July (6B, ESBS, VBS1)

Location	Subyearling chinook				Yearling chinook				Steelhead				Coho				Sockeye			
	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot
Level 1	1			1																
Level 2	6	5	14	25																
Level 3	10	13	12	35																
Level 4	17	11	25	53																
Level 5	35	29	36	100																
Level 6	20	9	22	51																
Level 7	2	2		4																
Net total	91	69	109	269																
Gatewell				404																
Total				673																
FGE (%)				60																

Appendix Table 3. Continued.

12 July (5B, ESBS, VBS2)

Location	Subyearling chinook				Yearling chinook				Steelhead				Coho				Sockeye			
	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot
Level 1																				
Level 2	2	4	7	13																
Level 3	11	7	11	29																
Level 4	13	15	14	42																
Level 5	14	17	14	45																
Level 6	4	2	3	9																
Level 7	1			1																
Net total	45	45	49	139																
Gatewell				391				2												
Total				530				2												
FGE (%)				73				100												

12 July (6B, ESBS, VBS1)

Location	Subyearling chinook				Yearling chinook				Steelhead				Coho				Sockeye			
	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot
Level 1																				
Level 2	7		5	12																
Level 3	3	3	13	19																
Level 4	3	5	6	14																
Level 5	8	11	9	28		1		1												
Level 6	4	4	2	10																
Level 7																				
Net total	25	23	35	83		1		1												
Gatewell				184																1
Total				267				1												1
FGE (%)				69				0												100

Appendix Table 3. Continued.

13 July (5B, ESBS, VBS2)

Location	Subyearling chinook				Yearling chinook				Steelhead				Coho				Sockeye			
	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot
Level 1		1	1	2																
Level 2		2	7	9																
Level 3	8	3	4	15																
Level 4	5	6	11	22																
Level 5	9	10	9	28																
Level 6	2	1	5	8																
Level 7		1		1																
Net total	24	24	27	85																
Gatewell				232				1				4								1
Total				317				1				4								1
FGE (%)				73				100				100								100

13 July (6B, ESBS, VBS1)

Location	Subyearling chinook				Yearling chinook				Steelhead				Coho				Sockeye			
	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot
Level 1																				
Level 2	1	2	3																	
Level 3	1	4	3	8																
Level 4	2	6	5	13																
Level 5	5	3	5	13																
Level 6	2	1	4	7																
Level 7			2	2																
Net total	10	15	26	46																
Gatewell				126								2								
Total				172								2								
FGE (%)				73								100								

Appendix Table 3. Continued.

14 July (5B, ESBS, VBS2)

Location	Subyearling chinook				Yearling chinook				Steelhead				Coho				Sockeye			
	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot
Level 1	1		1	2																
Level 2	2	3	4	9																
Level 3	7	6	7	20																
Level 4	7	15	8	30																
Level 5	19	18	20	57																
Level 6	9	2	9	20																
Level 7	1	1	1	3																
Net total	46	45	50	141																
Gatewell				128																
Total				269																
FGE (%)				48																

14 July (6B, ESBS, VBS1)

Location	Subyearling chinook				Yearling chinook				Steelhead				Coho				Sockeye			
	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot
Level 1																				
Level 2	1		3	4																
Level 3	2	6	3	11																
Level 4	4	6	9	19																
Level 5	7	12	7	26																
Level 6	1	11	10	22																
Level 7																				
Net total	15	35	32	82																
Gatewell				131				1				1								1
Total				213				1				1								1
FGE (%)				62				100				100								100

Appendix Table 3. Continued.

15 July (5B, ESBS, VBS2)

Location	Subyearling chinook				Yearling chinook				Steelhead				Coho				Sockeye			
	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot
Level 1	2	2	5	9																
Level 2	13	58	29	100																
Level 3	25	27	40	92																
Level 4	76	71	75	222																
Level 5	73	47	92	212																
Level 6	15	18	31	64																
Level 7	1	2	2	5																
Net total	205	225	274	704																
Gatewell				1073				1												
Total				1777				1												
FGE (%)				60				100												

15 July (6B, ESBS, VBS1)

Location	Subyearling chinook				Yearling chinook				Steelhead				Coho				Sockeye			
	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot
Level 1		1		1																
Level 2	17	4	14	35																
Level 3	25	32	24	81																
Level 4	36	58	71	165																
Level 5	50	42	67	159																
Level 6	24	18	28	70			1	1												
Level 7	2	2	3	7																
Net total	154	157	207	518			1	1												
Gatewell				472																
Total				980				1												
FGE (%)				48				0												

Appendix Table 3. Continued.

16 July (5B, ESBS, VBS2)

Location	Subyearling chinook				Yearling chinook				Steelhead				Coho				Sockeye			
	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot
Level 1		2	1	3																
Level 2	5		11	16																
Level 3	17	10	25	52																
Level 4	31	31	39	101																
Level 5	46	49	61	156																
Level 6	20	20	18	58	1			1												
Level 7	1	3	1	5																
Net total	120	115	156	391	1			1												
Gatewell				416				1												1
Total				807				2												1
FGE (%)				52				50												100

16 July (6B, ESBS, VBS1)

Location	Subyearling chinook				Yearling chinook				Steelhead				Coho				Sockeye			
	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot
Level 1	1	1	1	3																
Level 2	7	7	7	21						1		1								
Level 3	22	36	23	81																
Level 4	25	36	43	104																
Level 5	33	30	54	117																
Level 6	2	18	14																	
Level 7		2	1	3																
Net total	90	130	143	363						1		1								
Gatewell				507																1
Total				870								1								1
FGE (%)				58								0								100

Appendix Table 3. Continued.

17 July (5B, ESBS, VBS2)

Location	Subyearling chinook				Yearling chinook				Steelhead				Coho				Sockeye			
	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot
Level 1	1	3	4	8																
Level 2	12	6	27	45																
Level 3	31	15	23	69																
Level 4	49	43	45	137			1	1												
Level 5	55	72	51	178																
Level 6	12	11	16	39																
Level 7	2		3	5																
Net total	162	150	169	481			1	1												
Gatewell				883				3												1
Total				1374				4												1
FGE (%)				65				75												100

17 July (6B, ESBS, VBS1)

Location	Subyearling chinook				Yearling chinook				Steelhead				Coho				Sockeye			
	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot
Level 1	1	1		2																
Level 2	6	6	26	28																
Level 3	14	15	24	53																
Level 4	26	25	40	91																
Level 5	37	22	27	86																
Level 6	17	18	27	62		1	1	2												
Level 7	2	1	2	5																
Net total	103	88	146	337		1	1	2												
Gatewell				553				1												
Total				890				3												
FGE (%)				61				33												

Appendix Table 3. Continued.

18 July (5B, ESBS, VBS2)

Location	Subyearling chinook				Yearling chinook				Steelhead				Coho				Sockeye			
	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot
Level 1		1	7	8																
Level 2	27	17	43	87																
Level 3	58	55	83	196																
Level 4	154	137	191	482																
Level 5	101	203	190	494																
Level 6	66	53	41	160																
Level 7	5	5	5	15																
Net total	411	471	560	1442																
Gatewell				1363																
Total				2805																
FGE (%)				49																

18 July (6B, ESBS, VBS1)

Location	Subyearling chinook				Yearling chinook				Steelhead				Coho				Sockeye			
	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot
Level 1		2		2																
Level 2	4	8	16	28																
Level 3	12	22	14	48																
Level 4	32	30	35	97																
Level 5	42	31	23	96																
Level 6	17	18	18	83																
Level 7	2	1	2	5																
Net total	109	112	108	329																
Gatewell				269																
Total				598																
FGE (%)				45																

Appendix Table 3. Continued.

19 July (5B, ESBS, VBS2)

Location	Subyearling chinook				Yearling chinook				Steelhead				Coho				Sockeye			
	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot
Level 1	11		7	18																
Level 2	22	6	44	72						1		1								
Level 3	46	52	49	147																
Level 4	90	94	105	289																
Level 5	131	142	151	424																
Level 6	48	63	63	174		1		1												
Level 7	8	4	4	16																
Net total	356	361	423	1140		1		1		1		1								
Gatewell				878				2				3								
Total				2018				3				4								
FGE (%)				44				67				75								

19 July (6B, ESBS, VBS1)

Location	Subyearling chinook				Yearling chinook				Steelhead				Coho				Sockeye			
	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot
Level 1	2	1	1	4																
Level 2	15	6	12	32																
Level 3	15	34	17	66																
Level 4	14	20	45	79																
Level 5	30	34	40	104																
Level 6	13	13	13	39																
Level 7	1	1		2																
Net total	89	109	128	326																
Gatewell				341								4								
Total				667								4								
FGE (%)				51								100								

Appendix Table 3. Continued.

20 July (5B, ESBS, VBS2)

Location	Subyearling chinook				Yearling chinook				Steelhead				Coho				Sockeye			
	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot
Level 1	2	2	2	6																
Level 2	7	5	21	33																
Level 3	35	36	37	88																
Level 4	36	33	36	105																
Level 5	24	47	71	142	1			1	1			1								
Level 6	26	18	33	77																
Level 7	1	2	2	5																
Net total	131	133	192	456	1			1	1			1								
Gatewell				424								3								
Total				880				1				4								
FGE (%)				48				0				75								

20 July (6B, ESBS, VBS1)

Location	Subyearling chinook				Yearling chinook				Steelhead				Coho				Sockeye			
	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot
Level 1																				
Level 2	5	2	6	13																
Level 3	10	11	16	37																
Level 4	10	29	23	62																
Level 5	31	37	39	107		1	1	2												
Level 6	9	17	19	45			1	1												
Level 7	1	1		2																
Net total	66	97	103	266		1	2	3												
Gatewell				216				2												
Total				482				5												
FGE (%)				45				40												

Appendix Table 3. Continued.

21 July (5B, ESBS, VBS2)

Location	Subyearling chinook				Yearling chinook				Steelhead				Coho				Sockeye			
	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot
Level 1		1	2	3																
Level 2	8	12	19	39																
Level 3	23	21	30	74																
Level 4	60	47	61	168																
Level 5	65	85	100	250		1		1												
Level 6	23	16	36	75																
Level 7	1	4	5	10																
Net total	180	186	253	619		1		1												
Gatewell				647				3				2								
Total				1366				4				2								
FGE (%)				51				75				100								

21 July (6B, ESBS, VBS1)

Location	Subyearling chinook				Yearling chinook				Steelhead				Coho				Sockeye			
	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot
Level 1		1		1																
Level 2	6	7	9	22																
Level 3	5	5	13	23																
Level 4	17	18	27	62																
Level 5	12	20	26	58	1			1												
Level 6	10	18	20	48																
Level 7	2	1	3	6																
Net total	52	70	98	220	1			1												
Gatewell				243								1								1
Total				263				1				1								1
FGE (%)				52				0				100								100

Appendix Table 3. Continued.

22 July (5B, ESBS, VBS2)

Location	Subyearling chinook				Yearling chinook				Steelhead				Coho				Sockeye			
	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot
Level 1	1		1	2			1	1												
Level 2	6	4	9	19																
Level 3	4	8	8	20																
Level 4	12	15	8	35																
Level 5	21	28	23	72																
Level 6	9	5	6	20																
Level 7	2	2	1	5																
Net total	55	62	56	173			1	1												
Gatewell				308				1				1								2
Total				481				2				1								2
FGE (%)				64				50				100								100

22 July (6B, ESBS, VBS1)

Location	Subyearling chinook				Yearling chinook				Steelhead				Coho				Sockeye			
	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot
Level 1																				
Level 2	3	3	10	16																
Level 3	16	15	11	39																
Level 4	19	21	17	57																
Level 5	13	19	25	57																
Level 6	5	8	9	22	1			1												
Level 7	1			1																
Net total	57	63	72	192	1			1												
Gatewell				234				1												
Total				462				2												
FGE (%)				55				50												

Appendix Table 3. Continued.

23 July (5B, ESBS, VBS2)

Location	Subyearling chinook				Yearling chinook				Steelhead				Coho				Sockeye			
	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot
Level 1																				
Level 2	5	2	6	13																
Level 3	9	2	8	19																
Level 4	13	14	9	36		1		1												
Level 5	15	13	19	47																
Level 6	5	9	2	16																
Level 7	1		1	2																
Net total	48	40	45	133		1		1												
Gatewell				158								3								
Total				291				1				3								
FGE (%)				54				0				100								

23 July (6B, ESBS, VBS1)

Location	Subyearling chinook				Yearling chinook				Steelhead				Coho				Sockeye			
	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot	L	C	R	Tot
Level 1		1		1																
Level 2	3	1	3	7																
Level 3	2	3	4	9																
Level 4	5	7	12	24																
Level 5	10	10	8	28																
Level 6	4	3	3	10																
Level 7																				
Net total	25	25	30	79																
Gatewell				77								1								
Total				156								1								
FGE (%)				49								100								