Studies to Determine the Effectiveness of Extended-Length Submersible Bar Screens at McNary Dam, 1992

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COASTAL ZONE AND ESTUARINE STUDIES

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CONTENTS

	Page
INTRODUCTION	1
OBJECTIVE 1: FISH GUIDANCE EFFICIENCY OF THE EXTENDED-LENGTH BAR SCREEN AND THE STANDARD-LENGTH SUBMERSIBLE TRAVELING SCREEN	4
Approach	4
Results and Discussion	9
Yearling Fish	11
Subyearling Fish	16
OBJECTIVE 2: EFFECT OF THE EXTENDED-LENGTH BAR SCREEN ON FISH CONDITION	18
Approach	18
Results and Discussion	19
Yearling Fish	21
Subyearling Fish	24
OBJECTIVE 3: LEVELS OF SMOLTIFICATION IN YEARLING AND SUBYEARLING CHINOOK SALMON	26
Approach	26
Results and Discussion	27
CONCLUSIONS	29
ACKNOWLEDGMENTS	31
REFERENCES	33
APPENDIX TABLES	35

INTRODUCTION

McNary Dam, at River Kilometer 467 (River Mile 292), is operated by the U.S. Army Corps of Engineers (COE) and is the fourth hydroelectric project from the mouth of the Columbia River. It is also the first dam downstream from the confluence of the Columbia and Snake Rivers, influencing anadromous fish migrations from both river systems. After the completion of McNary Dam in 1954, Schoeneman et al. (1961) estimated that yearling chinook salmon (*Oncorhynchus tshawytscha*) passing through turbines at the dam incurred 11% mortality.

A juvenile fish bypass system, installed at McNary Dam in 1981, includes a collection facility for handling salmonids in preparation for transportion by barge or truck to a release site below Bonneville Dam. The standard-length submersible traveling screens (STS), designed and installed to divert juvenile salmonids away from the turbine intakes and guide them into gatewells for collection, are an essential component of the bypass system.

Initial research by the National Marine Fisheries Service (NMFS) indicated that although the fish guidance efficiency (FGE) achieved with STSs for yearling chinook salmon and steelhead (*O. mykiss*) was acceptable (>70%), generally less than 50% of the subyearling chinook salmon were guided (Krcma et al. 1983; Swan and Norman 1987; Brege et al. 1988). In 1984, the FGE achieved with STSs for subyearling chinook was 33-46% (Krcma 1985).

Several investigators have noted a general inverse relationship between FGE for subyearling chinook and

surface-water temperature, possibly indicating an avoidance behavior (e.g., Krcma et al. 1983; Krcma et al. 1985; Wagner 1989; Gessel et al. 1991). Additional testing at McNary Dam suggested that guidance could be improved using a device which extended deeper into the water column (Swan and Norman 1987).

During spring and summer 1991, NMFS began testing an extended-length submersible traveling screen and an extended-length submersible bar screen; each was approximately 12.1 m (40 ft) long, or twice the length of the STS. Both extended-length screens increased FGE to about 80% for yearling chinook salmon and to well over 50% for subyearling chinook salmon, with no significant difference between devices (Brege et al. 1992). However, the extended-length bar screen caused less descaling of guided fish than the extended-length traveling screen. Therefore, the extended-length bar screen received further FGE evaluation at McNary Dam in 1992 and the extended-length traveling screen was used only for descaling tests while a redesigned, more streamlined extended-length traveling screen was being developed for prototype testing in 1993.

There is conflicting evidence concerning the relationship between physiological development and FGE. Data acquired at Lower Granite and Little Goose Dams from 1985 to 1989 suggested that fully smolted yearling chinook salmon were more susceptible to guidance by traveling screens than fish at intermediate stages of smoltification (Swan et al. 1987; Giorgi et al. 1988; Muir et al. 1988; Muir et al. 1990). However, research at Bonneville Dam in 1988 (Muir et al. 1989) and at McNary Dam in 1991 (Brege et al. 1992) found no significant relationship between

physiological development, as measured by gill Na^+-K^+ ATPase levels, and FGE.

In 1992, NMFS, under contract to COE, tested the comparative abilities of the extended-length bar screen and STS to guide juvenile salmonids from turbine intakes, as well as their relative effects on fish condition. Chinook salmon smolt development was monitored periodically in an attempt to correlate FGE to degree of smoltification.

Specific objectives in 1992 were:

1) Compare the fish guidance efficiency of the extended-length bar screen and the STS (control) for juvenile salmonids, particularly yearling and subyearling chinook salmon during the spring and summer outmigrations.
2) Evaluate the effect of the extended-length bar screen on juvenile salmonid descaling and compare to descaling with the STS (control).
3) Measure levels of smoltification in yearling and subyearling chinook salmon collected in gatewells and fyke nets during FGE tests conducted in the early, middle, and late segments of the spring and summer outmigrations.

In addition to the NMFS research, personnel from the COE's Waterways Experiment Station (WES) used underwater video imaging techniques to provide information concerning fish behavior near the surface of the guiding devices and the vertical barrier screen. Also, as part of a cooperative effort, bacterial kidney disease (BKD) analysis was performed by U.S. Fish and Wildlife Service (USFWS) personnel on fish collected for smoltification

measurements. Results of these two studies will be reported elsewhere.

OBJECTIVE 1: FISH GUIDANCE EFFICIENCY OF THE EXTENDED-LENGTH BAR SCREEN AND THE STANDARD-LENGTH SUBMERSIBLE TRAVELING SCREEN

Approach

Methods for determining FGE were similar to those used by Brege et al. (1992). Extended-length bar screens and fyke-net frames were placed in the B slots of Turbine Units 5 and 6 (Fig. 1). The half nets used in the upper two rows in 1991 were replaced with standard-size fyke nets in this study, since half nets provided no additional statistical benefit. Therefore, the fyke-net array used in 1992 consisted of three columns of seven nets or a complete complement of 21 nets per fyke-net frame (Fig. 1). Fyke nets were placed in the downstream (operating gate) slot because the size of the extended-length screen precluded direct attachment to the screen as done with the STS. Either extended-length bar screens or extended-length traveling screens were placed in the A and C slots of the test units to maintain uniform flows across the turbine intake. Extended-length traveling screens were modified by perforated plate porosity changes to reduce fish descaling. Initial screen conditions in test and control units were:

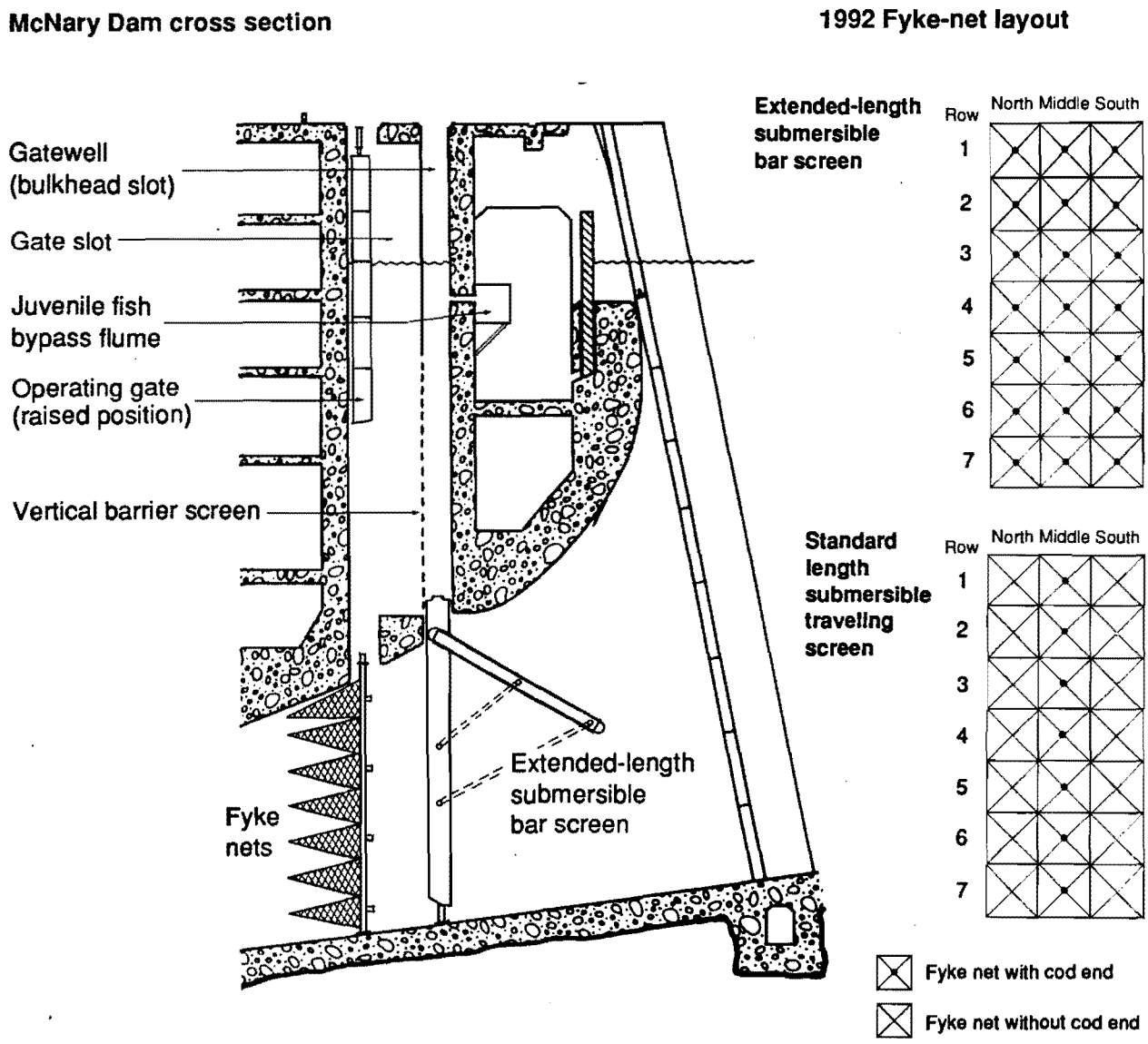
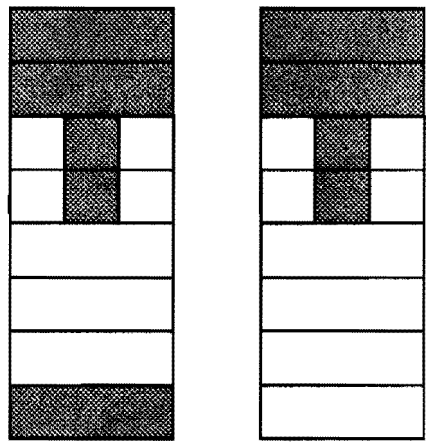


Figure 1.--Cross section of turbine unit at McNary Dam with extended-length submersible bar screen and fyke nets in place.

Turbine unit/slot	Screen type	Perforated plate porosity (%)
5A	Extended-length STS	25
5B	Extended-length bar screen	33
5C	Extended-length STS	34
6A	Extended-length bar screen	30
6B	Extended-length bar screen	37
6C	Extended-length STS	34
7B (Control)	STS	48

Extended-length screen slots in Turbine Units 5 and 6, and the control slot (7B) contained modified balanced-flow vertical barrier screens that separated the bulkhead slot (gatewell) from the operating gate slot and served to confine guided fish to the gatewell (Fig. 1). The difference between the vertical barrier screens used with the extended-length and standard-length guidance screens was the addition of a solid plate panel on the bottom section of the vertical barrier screen used with the extended-length screen (Fig. 2). This panel change was an attempt to improve conditions on immediate entry into the gatewell where flows increased due to the raised operating gate and the additional water column intercepted by extended-length screens.

Though test conditions varied for the extended-length screens in Slots 5B and 6B with regard to screen elevation, perforated plate porosity, and operating gate position, the STS in Slot 7B (control) was maintained at standard elevation with a 48% perforated plate porosity and with no operating gate (i.e., an operating gate that was fully raised or removed) for all



2a. 2b.

Figure 2.--Modified balanced-flow vertical barrier screen configurations used during fish guidance efficiency testing at McNary Dam, 1992. Shaded sections represent solid plate; open areas are monofilament mesh with perforated plate backing. All slots in test Units 5 and 6 contained the configuration in 2a. Slot 7B (control) had the arrangement shown in 2b.

tests. Screen angle was held constant at 55° for all screens throughout the 1992 field season.

Flows into test- and control-turbine intakes were maintained at 16,000 cfs for FGE studies during the yearling chinook salmon outmigration and reduced to 15,000 cfs for the subyearling run. This corresponded to a screen-approach velocity of about 2.5 fps and to turbine-unit loads of approximately 80 and 75 MW (dependent on forebay elevation) for the spring and summer runs, respectively.

Gatewell dipbasket catches provided the number of guided fish while the fyke-net catch yielded the number of unguided fish. Cod ends were placed on all fyke nets used with the extended-length bar screens. With the STS (control), however, cod ends were used only on the center column of fyke nets (Fig. 1). This was done with the STS to minimize fish mortalities and because previous statistical analyses of a similar configuration indicated that multiplying the center-column catch by 3 would provide a reasonable approximation of the total fyke-net catch (Gessel et al. 1986). Fish guidance efficiency for the extended-length bar screens was calculated as the number of guided fish divided by the total number of fish (by species) entering the turbine intake:

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

where GW = gatewell catch
FN = fyke-net catch.

Testing typically began at 2000 h and terminated when enough fish (>200) of the target species had been collected. Test dates and conditions for individual test series are listed in Table 1. All tests were carried out simultaneously for a given date in test slots 5B, 6B, and 7B. To accommodate the randomized block design and provide adequate statistical resolution, extended-length bar screen tests were conducted daily, while STS tests were conducted every second test day during the spring outmigration. Slot 5B was not available for FGE tests from 6 to 16 July. Also, due to procedure problems, data obtained for the night of 6 July were omitted from analyses. Following 6 July, the test design was modified to a randomized block analysis of variance, initially to a 4-day block design, utilizing Slot 6B only, and later to a 2-day block design, when Slot 5B became available. The STS in the control slot (7B) was tested daily during this summer period.

Dipbasket efficiency testing was conducted as in past FGE studies (Krcma et al. 1985). Freeze-branded yearling chinook salmon and steelhead, obtained from the juvenile fish-collection facility at McNary Dam, were released into the gatewell of the test unit prior to the start of the FGE test, and removed after the test along with the gatewell catch.

Results and Discussion

A dipbasket efficiency test was conducted during the FGE test in Slot 6B on 29 May. Test results indicated a dipbasket efficiency of 96.9% for yearling chinook salmon and 94.9% for steelhead.

Table 1.--Test schedule for the 1992 field season at McNary Dam. Screen angle was maintained at 55° for all tests, with modified balanced flow vertical barrier screens in all test and control slots.

Test series	Test dates	Test type	Guidance device	Unit slot	Flow (kcfs)	Operating gate position	Perforated plate porosity (%)	Screen elevation
1	27 - 28 April	FGE[a]	ESBS[b]	5B	16	NOG[c]	33	Std[d]/low 60 cm[e]
		FGE	ESBS	6B	16	NOG	37	Std/low 90 cm[f]
		FGE/Des[g]	STS[h]	7B	16	NOG	48	Std
2	29 - 30 April	FGE	ESBS	5B	16	NOG	33	Std/low 60 cm
	4 - 5 May	FGE	ESBS	6B	16	NOG	30	Std/low 60 cm
		FGE/Des	STS	7B	16	NOG	48	Std
3	6 - 8 May	FGE	ESBS	5B	16	PROG[i]	33	Std/low 60 cm
		FGE	ESBS	6B	16	PROG	30	Std
		FGE/Des	STS	7B	16	NOG	48	Std
4	11 - 15 May	Des	ESTS[j]	5A	16/12	SOG[k]	25	Std
		Des	ESBS	5B	16/12	SOG	26	Std
		Des	ESBS	6A	16/12	NOG	30	Std
		Des	ESBS	6B	16/12	SOG	30	Std
		Des	STS	7B	16/12	NOG	48	Std
5	18 - 21 May	Des	ESTS	5A	16	SOG	25	Std
		FGE	ESBS	5B	16	PROG	26	Std
		Des	ESTS	5C	16	NOG	34	Std
		Des	ESBS	6A	16	NOG	30	Std
		FGE	ESBS	6B	16	PROG	30	Std
		FGE/Des	STS	7B	16	NOG	48	Std
6	26 - 29 May	Des	ESTS	5A	16	SOG	25	Std
		FGE	ESBS	5B	16	NOG	26	Std
		Des	ESTS	5C	16	NOG	34	Std
		Des	ESBS	6A	16	NOG	30	Std
		FGE	ESBS	6B	16	PROG	30	Std
		FGE/Des	STS	7B	16	NOG	48	Std
7	22 - 29 June	FGE	ESBS	5B	15	NOG	33	Std
		FGE	ESBS	6B	15	NOG	30	Std
		FGE	STS	7B	15	NOG	48	Std
8	6 - 11 July	FGE/Des	ESBS	5B	15	NOG/PROG	30	Low 60 cm
	13 - 18 July	FGE	ESBS	6B	15	NOG/PROG	30	Std/low 60 cm
	20 - 24 July	FGE	STS	7B	15	NOG	48	Std

[a] Fish guidance efficiency test (includes descaling).
[b] Extended-length submersible bar screen.
[c] No operating gate (fully raised or removed).
[d] Standard screen elevation.
[e] Screen lowered 60 cm below standard elevation.
[f] Screen lowered 90 cm below standard elevation.
[g] Descaling test, separate from FGE tests.
[h] Standard-length submersible traveling screen.
[i] Partially raised operating gate (raised 2.4 m).
[j] Extended-length submersible traveling screen.
[k] Stored operating gate (standard position).

Yearling Fish

FGE tests for yearling chinook salmon were conducted in 5 series from 27 April through 29 May (Table 1, Test Series 1-3,5,6). Results for individual test nights are presented in Appendix Table 1. Fish guidance efficiency averaged 80% (SE = 1.0) for the combined extended-length screens compared to 61% (SE = 5.9) for the STS during the yearling chinook salmon spring outmigration.

Mean FGE values with extended-length bar screens for yearling chinook salmon were 82% (SE = 1.1) on the first night of testing and 75% (SE = 9.2) on the second, with no operating gate in the test units and 33 and 37% perforated plate porosities, respectively. By comparison, FGE for one test with the STS (control) during this period was 53% (Fig. 3, Test Series 1). However, mean descaling for the extended-length bar screens (28.9 and 23.4% for Slots 5B and 6B, respectively, 26.2% combined) was over three times higher than descaling in the control unit (8.6%). Additionally, the fyke-net catch distribution with the extended-length bar screen in the 90-cm (36-in) lowered position indicated that a high percentage (20%) of fish passed through a gap between the turbine intake ceiling and the extended-length bar screen, reducing FGE (Figs. 3 and 4, Slot 6B, Test Series 1). A direct measure of loss through this gap was not possible due to the placement of the fyke-net frame in the downstream (operating gate) slot, which prevented the use of a gap net. As a consequence of unacceptable descaling and the apparent gap loss, the 90-cm lowered screen condition was omitted from further

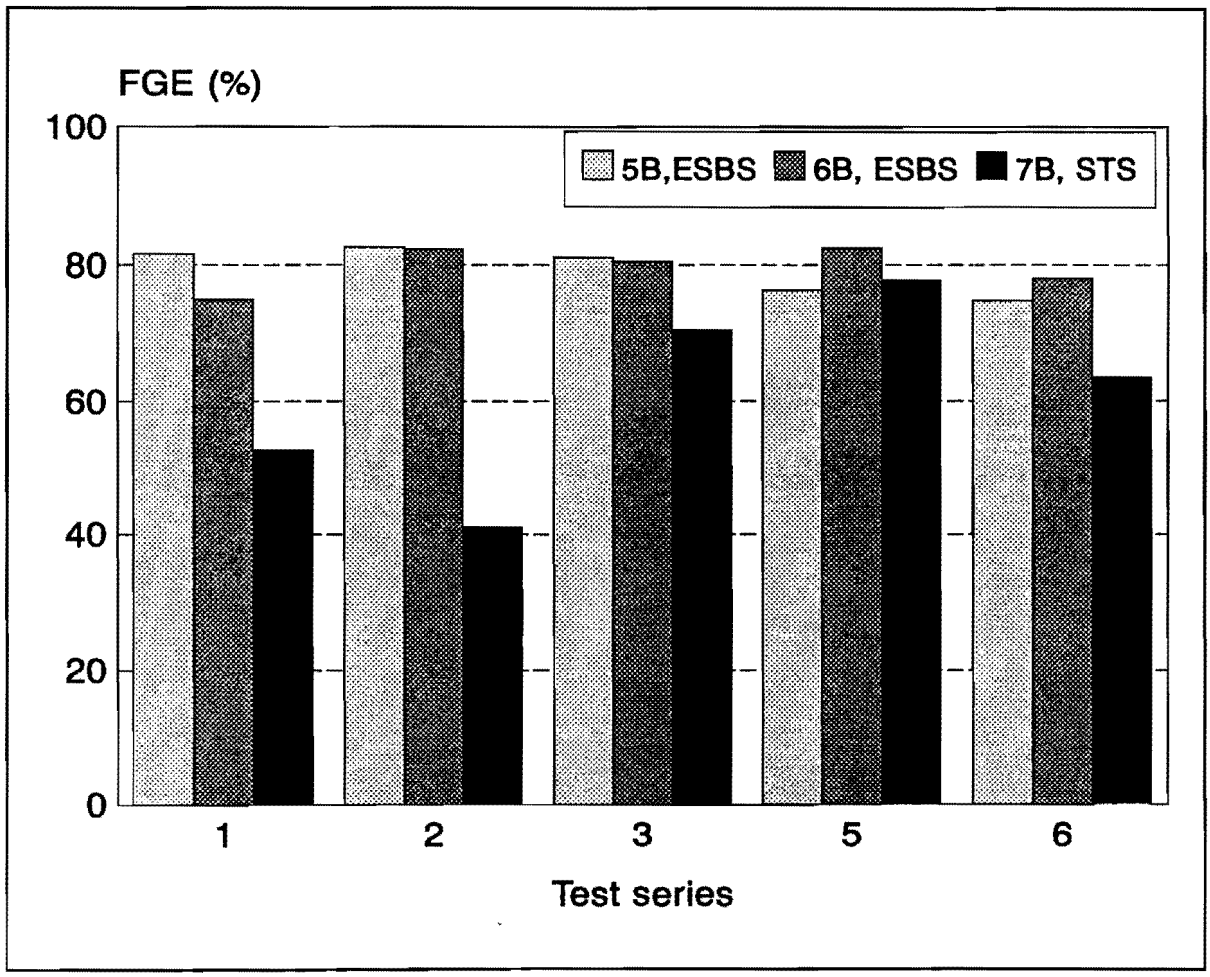
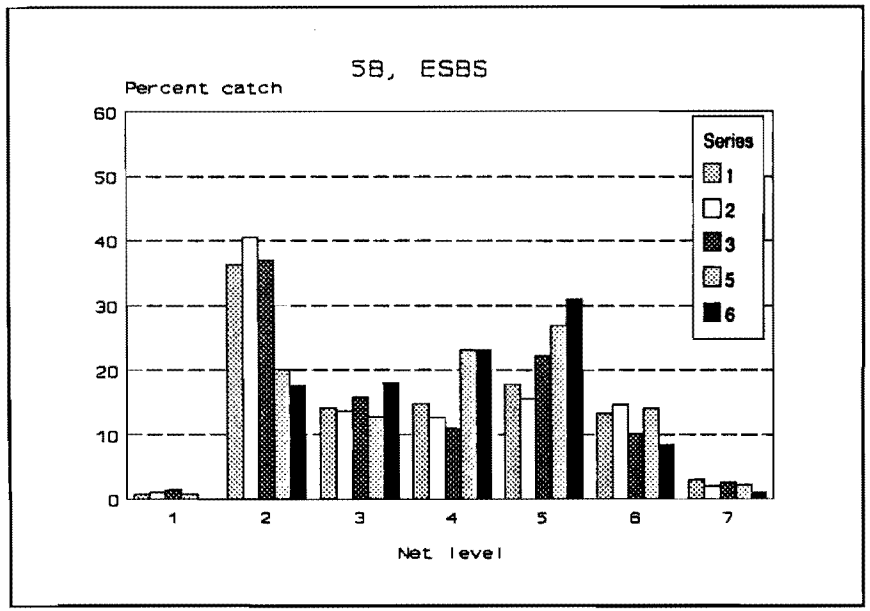
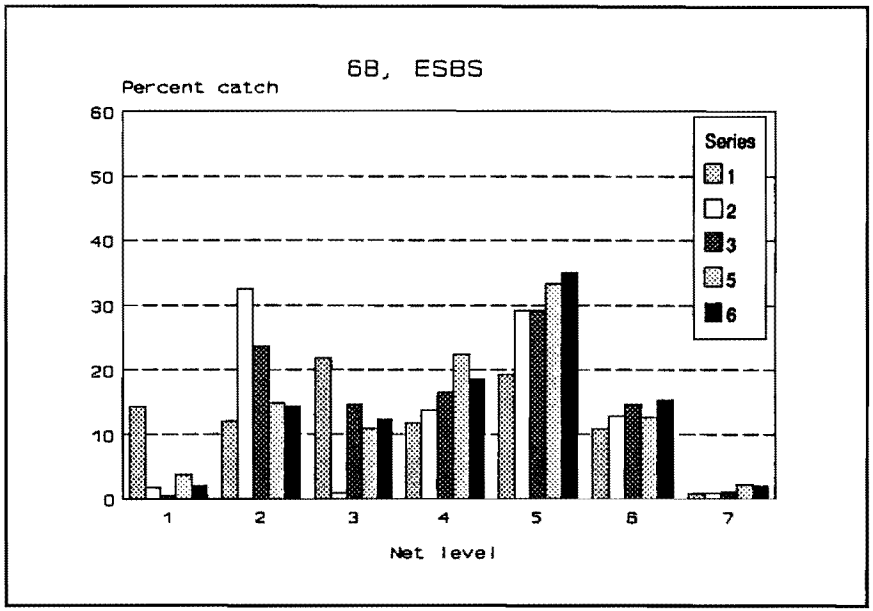


Figure 3.--Mean yearling chinook salmon fish guidance efficiency for tests conducted with extended-length submersible bar screens (ESBS) and a standard-length submersible traveling screen (STS) at McNary Dam, 1992. Test series numbers refer to Table 1 (Series 4 did not include FGE tests).





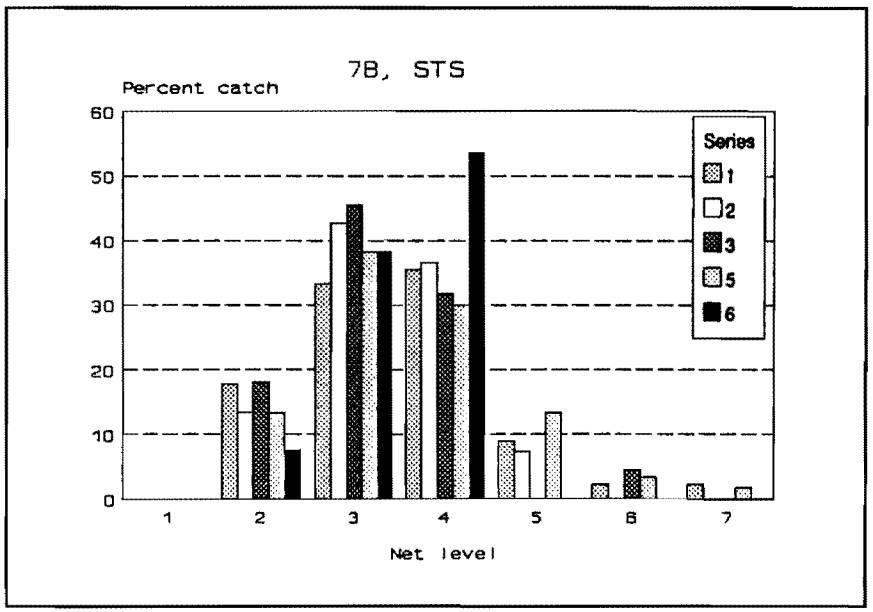


Figure 4.--Percent net catch by fyke-net level for yearling chinook salmon captured during fish guidance efficiency tests with extended-length submersible bar screens (ESBS) and standard-length submersible traveling screens (STS) at McNary Dam, 1992. Legend series numbers refer to test series in Table 1.

testing and the 37% perforated plate porosity was changed to 30% in Slot 6B.

Test Series 2 was also conducted with no operating gates in the test slots and with the extended-length bar screens alternated between standard and 60-cm (24-in) lowered elevations. Results indicated high FGE, averaging 83% (SE = 2.3) with the 33% perforated plate porosity and 82% (SE = 2.9) with the 30% perforated plate porosity (Fig 3, Test Series 2). However, descaling with the extended-length screens (means = 21.6 and 19.3% for 5B and 6B, respectively; combined mean = 20.5%, n = 4) was still more than double the descaling with the STS (mean = 8.9%, n = 2). Mean FGE with the STS was 41% (SE = 5.4) for this series.

Test designs to decrease descaling became a primary objective for the remainder of the spring outmigration. One major area of concern was the high flow (near 600 cfs) into the gatewell slot using the extended-length screens with no operating gate. It was calculated that raising the operating gate 2.4 m above the stored operating gate position would restrict flows into the gatewell slot to about 450 cfs. This flow rate would be similar to flows achieved with the STS using no operating gate which produced relatively low descaling.

A three-night block of tests was carried out to investigate the possibility that a partially raised operating gate would control flows into the gatewell. It was hoped the partially raised gate would enable fish to avoid striking either the extended-length bar screen or the vertical barrier screen, and

thereby lower descaling. With the operating gate raised 2.4 m above the normal stored position, FGE for the extended-length bar screen averaged 81% with both the 33 and 30% perforated plate porosities, respectively (SE = 1.7 and 3.6), and descaling was reduced to respective means of 18.1 and 12.4%. The STS had a mean FGE of 71% (Fig. 3, Test Series 3) and mean descaling of 8.4%. The 60-cm lowered-elevation setting with the extended-length bar screen was eliminated as a test condition following Test Series 3 because it apparently neither increased FGE nor decreased descaling.

For the final two spring FGE test series, the 33% perforated plate porosity with the extended-length bar screen in Slot 5B was changed to 26%. This was done to examine the hypothesis that a perforated plate porosity lower than 30% would further decrease descaling while maintaining acceptable FGE. The mean FGE values in Slot 5B were 76 (SE = 1.7) and 75% (SE = 1.7) with a partially raised operating gate (Test Series 5) and no operating gate (Test Series 6) respectively (Fig. 3). For the extended-length bar screen with a partially raised operating gate and 30% perforated plate porosity in Slot 6B, mean FGE was 82 (SE = 1.3) and 78% (SE = 4.0) for Series 5 and 6. Fish guidance efficiency for the STS averaged 78 (SE = 13.0) and 64% (SE = 3.1) for these series, respectively.

There was a marked difference in fyke-net catch distribution between screen types (standard vs. extended-length) and between series for the extended-length screens (Fig. 4). With the STS in Slot 7B, captures tended to concentrate at Net Levels 3 and 4,

while the net level of captures with the extended-length bar screens varied by series. When screens were lowered in the first three series, catches were bimodal, with high numbers in Net Levels 2 and 5. As mentioned above, this suggested that a high proportion of fish were shunted over the top of the screen (through the gap) and into the fyke nets (at Net Level 2) rather than deflected up into the gatewell. With the extended-length bar screen in Slot 6B lowered 90 cm on the first test night, the first three net levels accounted for 74% of the fyke-net captures. When the extended-length screens were set at standard elevation during the last two FGE series, Net Level 5 contained the highest mean percentage of yearling chinook salmon (29.0% for Slot 5B and 34.2% for Slot 6B). Net Levels 3 and 4 accounted for 72.6% of the total fyke-net catch in Slot 7B for the same two series.

Steelhead, coho (O. kisutch), and sockeye salmon (O. nerka) were captured incidentally during FGE tests. Fish guidance efficiency values over the entire study period for each of the screens and for each test are listed by species in Appendix Table 1.

Subyearling Fish

Fish guidance efficiency testing with subyearling chinook salmon began 22 June and ran through 24 July, comprising two series (Table 1, Test Series 7 and 8).

Due to unacceptable performance in the spring test, the 26% perforated plate porosity on the extended-length bar screen in Slot 5B was changed to 33% for the first series (Series 7), while

the extended-length bar screen in Slot 6B retained the 30% perforated plate porosity. Also, based on 1991 test results, which indicated that increased flows into the gatewell improved guidance with little increased descaling for subyearling chinook (Brege et al. 1992), operating gates were removed from the extended-length screen test slots. With no operating gates in Slots 5B and 6B, FGE averaged 68 and 66%, respectively. The difference was not significant ($t = 1.33$, $df = 7$, $P = 0.2252$).

The second subyearling chinook series (Series 8) began as a single turbine unit 4-day block in Slot 6B, since Slot 5B was dedicated to WES investigations during this period. Combinations of screen elevation (standard vs. 60-cm lowered) and operating gate position (no operating gate vs. partially raised operating gate) were tested with the 30% perforated plate porosity. When Slot 5B became available again on 17 July, perforated plate porosity was changed to 30% and the test design was changed to a two-unit, 2-day block design with screens at lowered elevation in Slot 5B and standard elevation in 6B.

Since the actual difference between FGE values for extended-length screens and those of standard-length screens could be concealed by natural fluctuations in FGE values, the beneficial effects of a given set of extended-length screen test conditions could be masked. To overcome this problem, means were adjusted by subtracting FGE values for the control condition (STS in 7B) from corresponding daily values for the extended-length screens. During these test series, differences in FGE means for extended-length screens with subyearling chinook salmon were

similar for both unadjusted and adjusted data. With screens at standard elevation, unadjusted mean FGE values were 43 and 48% using a partially raised operating gate and no operating gate, respectively. Unadjusted means for screens at the lowered elevation were 45% with a partially raised operating gate and 47% with no operating gate. None of the combinations of screen elevation and operating gate setting were significantly different for either the unadjusted or adjusted data ($F = 1.09$, $df = 1,14$, $P = 0.6822$).

Over the course of the subyearling chinook salmon outmigration, FGE for the extended-length bar screen in Slot 6B with a 30% perforated plate porosity averaged 53% with various screen and gate settings. Mean FGE values for Slot 6B and the control (STS in Slot 7B) were 50 and 30%, respectively, for those days when the units were paired for testing purposes. This significant difference ($t = 8.87$, $df = 19$, $P < 0.0001$) clearly indicated the FGE benefits provided by the extended-length bar screen for subyearling chinook salmon.

OBJECTIVE 2: EFFECT OF THE EXTENDED-LENGTH BAR SCREEN ON FISH CONDITION

Approach

Fish condition was evaluated using standard criteria developed by the Fish Transportation Oversight Team and was defined as the number of descaled guided fish divided by the total number of guided fish recovered by species from the gatewell. All juvenile salmonids recovered from the gatewells were examined for descaling during each of the FGE and descaling

tests. The descaling test design followed that used for FGE tests, except that:

1) Descaling was tested daily for the STS.
2) From 10 May to the end of the yearling chinook salmon outmigration, additional testing was carried out on three screens not included in the FGE tests (in Slots 5A, 5C, and 6A). This allowed monitoring of the effects of extended-length traveling screens in Slots 5A and 5C and provided support for the WES effort in Slot 6A.
3) A 1-week block of tests was added (Series 4), during which no FGE testing was done, to compare the effects of turbine intake flow variation on descaling. Stored operating gates were used in all units for this series since this condition reduced flows into the gatewell and minimized descaling.

Differences between conditions were tested using two-sample and paired t-tests, two-factor analysis of variance, and randomized block analysis of variance. Fisher's protected least significant difference (LSD) procedure was used to detect differences between treatments within blocks.

Results and Discussion

Mean descaling results for yearling and subyearling chinook salmon and steelhead are listed in Table 2 by series test date. Appendix Table 2 contains complete descaling data for all species by turbine unit and test date.

Table 2.--Mean percent descaling of yearling and subyearling chinook salmon and steelhead during FGE testing at McNary Dam, 1992.

Test series	Test dates	Test unit	Guidance device	Operating gate position	Yearling chinook salmon Mean	Yearling chinook salmon SE	Steelhead Mean	Steelhead SE	Subyearling chinook salmon Mean	Subyearling chinook salmon SE
1	27 - 28 April	5B	ESBS[a]	NOG[b]	28.9	1.5	19.7	5.4		
		6B	ESBS	NOG	23.4	6.0	17.8	1.1		
		7B	STS[c]	NOG	8.6		6.7			
2	29 - 30 April	5B	ESBS	NOG	21.6	4.6	10.2	3.1		
	4 - 5 May	6B	ESBS[d]	NOG	19.3	2.3	7.1	2.6		
		7B	STS	NOG	9.2	0.7	5.7	3.9		
3	6 - 8 May	5B	ESBS	PROG[e]	18.1	3.3	11.1	1.9		
		6B	ESBS	PROG	12.4	0.8	5.4	0.9		
		7B	STS	NOG	8.9	2.6	4.7	4.7		
4	11 - 15 May	5A	ESTS[f]	SOG[g]	16.2	1.9	7.1	2.0		
	(12 kcfs)	5B	ESBS[h]	SOG	18.1	2.6	5.0	2.6		
		6A	ESBS	NOG	18.0		5.0			
		6B	ESBS	SOG	19.9	6.7	10.8	5.0		
		7B	STS	NOG	10.9	4.4	6.8	1.7		
4	11 - 15 May	5A	ESTS	SOG	15.1	2.0	8.9	2.0		
	(16 kcfs)	5B	ESBS	SOG	17.3	1.8	5.7	1.2		
		6A	ESBS	NOG	10.7		8.9			
		6B	ESBS	SOG	16.1	1.4	5.6	0.8		
		7B	STS	NOG	8.8	0.9	5.9	1.7		
5	18 - 21 May	5A	ESTS	SOG	13.9	2.2	9.7	1.8		
		5B	ESBS	PROG	14.3	2.0	11.0	1.9		
		5C	ESTS	NOG	11.0	0.6	12.7	2.1		
		6A	ESBS	NOG	9.0	1.3	11.0	2.6		
		6B	ESBS	PROG	9.9	1.1	9.3	0.3		
		7B	STS	NOG	9.3	2.1	9.6	1.9		
6	26 - 29 May	5A	ESTS	SOG	21.3	2.1	13.9	2.9		
		5B	ESBS	PROG	24.7	2.0	17.8	3.6		
		5C	ESTS	NOG	25.3	3.1	8.4	3.4		
		6A	ESBS	NOG	17.6	2.0	12.0	2.0		
		6B	ESBS	PROG	16.0	1.6	15.1	4.8		
		7B	STS	NOG	13.8	1.7	16.4	2.1		
7	22 - 29 June	5B	ESBS[i]	NOG					8.0	1.7
		6B	ESBS	NOG					4.5	1.2
		7B	STS	NOG					6.3	1.1
8	6 - 11 July	5B	ESBS[d]	NOG/PROG					12.3	1.4
	13 - 18 July	6B	ESBS	NOG/PROG					9.0	2.0
	21 - 24 July	7B	STS	NOG					2.9	0.5

[a] Extended-length submersible bar screen.
[b] No operating gate (fully raised or removed).
[c] Standard-length submersible traveling screen.
[d] Perforated plate porosity changed to 30%.
[e] Partially raised operating gate (2.4 m raised).
[f] Extended-length submersible traveling screen.
[g] Stored operating gate (standard position).
[h] Perforated plate porosity changed to 26%.
[i] Perforated plate porosity changed to 33%.

Yearling Fish

Descaling test analyses, results, and conditions for the various treatments are presented in Appendix Table 3.

Descaling was the major consideration driving test design during the spring outmigration in 1992. Various combinations of operating gate position, screen elevation, and perforated plate porosity were tested in an attempt to bring extended-length bar screen descaling more in line with STS descaling (Fig. 5). This resulted in a test design with few trials in some series, which limited statistical resolution.

Investigation of the effect of lowering the extended-length screen below standard elevation as a possible strategy for reducing descaling was abandoned after the first 2 weeks. However, a two-sample t-test revealed no difference in mean descaling between the lowered and standard screen elevations for the limited number of tests conducted in Slot 5B with a 33% perforated plate porosity ($t = 2.02$, $df = 7$, $P = 0.08$). Similarly, there was no difference between either of the extended-length screens with 33 and 30% perforated plate porosity and no operating gate when the screen elevations were randomly alternated between lowered and standard elevations ($F = 3.11$, $df = 2,5$, $P = 0.13$). However, when the same perforated plate porosity and screen elevation parameters were compared using a partially raised operating gate during the third test series, a difference was found between the 33% perforated plate porosity with extended-length bar screen in Slot 5B and both the 30% perforated plate porosity with extended-length bar screen in 6B

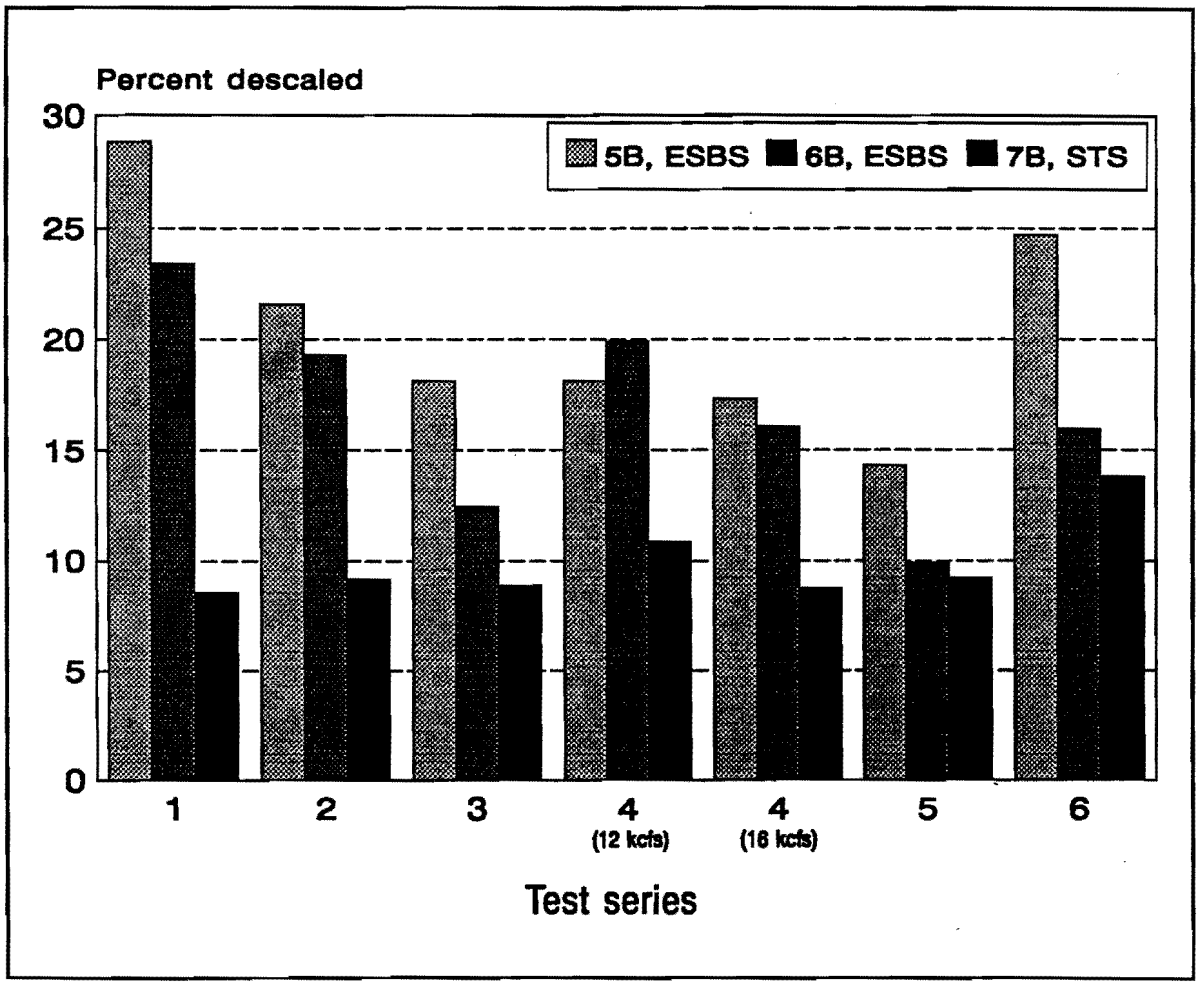


Figure 5.--Mean descaling values for yearling chinook salmon obtained during fish guidance efficiency and descaling tests with extended-length submersible bar screens (ESBS) and standard-length submersible traveling screens (STS) at McNary Dam, 1992. Test conditions for each test series are presented in Table 1.

and the STS in 7B (control) ($F = 10.1$, $df = 2,4$, $P = 0.02$). Subsequent descaling tests, with all screens set at the standard elevation, concentrated on changes in perforated plate porosity and operating gate position for achieving the lowest descaling rates.

Descaling tests (without FGE tests) were performed each night from 11 to 15 May to evaluate the effects of different flows into the turbine intakes (Test Series 4, Table 2). All slots except the control (7B) had stored operating gates. Each night, flows of 12 and 16 kcfs were tested in each of the three turbine units. A two-factor analysis of variance revealed no significant differences in yearling chinook salmon mean descaling for this test series comparing either flow ($F = 0.63$, $df = 1,20$, $P = 0.4$) or flow combined with screen effects ($F = 0.10$, $df = 5,15$, $P = 0.96$). However, yearling chinook salmon descaling values were significantly lower in Slot 7B (control) than in the extended-length screen Slots 5B and 6B when only screen effects were considered ($F = 3.18$, $df = 3,20$, $P = 0.05$).

Descaling tests were conducted in Slots 5A, 5C, and 6A in addition to scheduled FGE testing in Slots 5B, 6B, and 7B during Test Series 5 (18-21 May) and 6 (26-29 May) (Table 2). There were no significant differences in mean descaling values for yearling chinook salmon among any of the six slots tested during Series 5 ($F = 2.12$, $df = 5,15$, $P = 0.12$).

Significant differences in mean descaling values were found among the six slots for Test Series 6 ($F = 4.30$, $df = 5,15$, $P = 0.01$). Analysis of data for Test Series 6 by Fisher's LSD

procedure revealed that mean descaling for Slot 7B (control) was significantly lower than mean descaling for any slots in Unit 5, and Slots 6A and 6B had significantly lower mean descaling than Slots 5B and 5C. However, for Test Series 6 there were no significant differences in mean descaling among slots within individual units, among Slots 6A, 6B, and 7B, or among Slots 5A, 6A, and 6B for Test Series 6.

Of all the configurations examined, the extended-length bar screen in Slot 6B at standard elevation, with 30% perforated plate porosity, and with a 2.4-m partially raised operating gate, appeared to be the extended-length bar screen configuration which caused the least descaling. A paired t-test between all occurrences of this combination of conditions for the extended-length bar screen in 6B and the STS in 7B (control) revealed no significant difference ($t = 1.96$, $df = 10$, $P = 0.08$) in yearling chinook salmon descaling.

Subyearling Fish

Descaling tests for subyearling chinook salmon were conducted with FGE testing during the outmigration in June and July, and resulted in two complete series (Test Series 7 and 8, Table 2).

For the first summer series, Slot 6B retained the 30% perforated plate porosity. The perforated plate porosity on the extended-length bar screen in Slot 5B was changed from 26 to 33% because of the poor performance at 26%. Since earlier testing had indicated that subyearling chinook salmon were affected less than yearling fish by increased flows into the gatewell,

operating gates were not used in either test or control slots during the first subyearling test (Test Series 7). Descaling averaged 8.0, 4.5, and 6.3 in Slots 5B, 6B, and 7B, respectively. The differences were not significant when analyzed by randomized block analysis of variance ($F = 1.95$, $df = 2,14$, $P = 0.18$).

As with FGE, four combinations of screen elevation and operating gate settings were tested using a 30% perforated plate porosity during the second summer series. Descaling averaged 12.3, 9.0, and 2.9 in Slots 5B, 6B and 7B, respectively. Data were adjusted for each set of extended-length screen conditions by subtracting the corresponding background mean (Slot 7B, control). Differences in mean descaling for the unadjusted and adjusted data were similar.

Descaling results may have been affected by the presence of adult shad (*Alosa sapidissima*) in the catch during some tests, which appeared to increase the incidence of subyearling chinook salmon descaling. For example, descaling with the extended-length bar screen in Slot 6B averaged 5.0% (SE = 0.8) for tests when adult shad were not conspicuously present in the catch, compared with 7.5% (SE = 1.4) when all data were included. The randomized block analysis of variance procedure therefore included an adult shad covariate. However, none of the combinations of operating gate position and screen elevation were significantly different for either the unadjusted ($F = 0.00$, $df = 1,14$, $P = 0.99$) or the adjusted descaling data ($F = 0.01$, $df = 1,13$, $P = 0.93$), regardless of the presence of adult shad.

Descaling values for tests using a 30% porosity perforated plate were 13.7 and 9.6% for Slot 5B, and 7.7 and 7.0% for Slot 6B with no operating gate and partially raised operating gate conditions, respectively. When high numbers of adult shad were not captured with the gatewell catch, descaling in Slot 6B with a 30% porosity perforated plate was 5.0%, compared to a mean of 4.0% for the STS (control) in 7B. The differences were not significant ($t = 0.49$, $df = 19$, $P = 0.63$).

OBJECTIVE 3: LEVELS OF SMOLTIFICATION IN YEARLING AND SUBYEARLING CHINOOK SALMON

Approach

Fish were collected during FGE tests in Unit 5B and gill Na^+-K^+ ATPase levels were assayed to examine the relationship between FGE and physiological development. Twenty chinook salmon were sampled from the gatewell (guided fish), with yearlings sampled during the spring and subyearlings during the summer. Fish were placed on ice until gill samples could be taken. On the same dates and during the same FGE tests, 20 fish were also randomly sampled from the fyke-net catch (unguided fish). To ensure that any observed differences in gill Na^+-K^+ ATPase between live gatewell and dead fyke-net fish were not caused by deterioration of this enzyme in the dead fish, gatewell fish were killed and placed in water at ambient river temperature until the fyke nets were removed from the water.

Gills that showed signs of excess deterioration were discarded. Fish were measured and gill filaments were trimmed from the gill arch and placed into 1.5-ml microcentrifuge tubes

filled with a buffer solution containing sucrose, ethylenediamine, and imidazole (SEI). Samples were immediately placed in an ice chest containing dry ice and later stored in a freezer and held at <-70°C until assayed. After gill removal, fish were individually stored in labeled plastic bags and placed on dry ice for later analysis by the USFWS for BKD (results reported separately). Assays for gill Na^+-K^+ ATPase were conducted using procedures described by Zaugg (1982) with minor modification.

To characterize the physiological status of the smolt population on each sample date, the mean Na^+-K^+ gill ATPase level was determined for fish from the gatewell and fyke nets, weighted for the number of fish captured, and averaged. Because FGE and descaling tests often required important changes in guidance system components during the 1992 outmigrations, we did not attempt to identify correlations between physiological development and FGE. A paired t-test was used to test for seasonal differences in enzyme levels in guided vs. unguided fish.

Results and Discussion

Yearling chinook salmon gill Na^+-K^+ ATPase activity changed little during the spring sampling period (Table 3 and Appendix Table 4). Mean enzyme levels ranged from 29.3 to 35.5 μmol P_i · mg $Prot^{-1}$ · h^{-1}. There was no significant difference between gill Na^+-K^+ ATPase activity levels in guided (gatewell) vs. unguided (fyke net) yearling chinook salmon overall ($t = -0.31$, $df = 4$, $P = 0.774$) (Table 4).

Table 3.--FGE results, weighted mean gill Na^+-K^+ ATPase level (µmol P_i · mg $Prot^{-1}$ · h^{-1}), and test conditions during smoltification studies of chinook salmon at McNary Dam, 1992 (---- indicates samples collected were lost due to storage problems).

Date	Operating gate position*	Perforated plate porosity (%)	Screen elevation	Age	Sample size	FGE (%)	Gill Na^+-K^+ ATPase
29 Apr	NOG	33	Lowered 60 cm	Yearling	40	74	35.5
30 Apr	NOG	33	Standard	Yearling	40	87	31.5
18 May	PROG	26	Standard	Yearling	20	76	----
19 May	PROG	26	Standard	Yearling	40	72	33.2
28 May	NOG	26	Standard	Yearling	40	74	31.4
29 May	NOG	26	Standard	Yearling	39	76	29.3
25 Jun	NOG	33	Standard	Subyearling	32	68	26.6
26 Jun	NOG	33	Standard	Subyearling	20	72	----

*NOG = No operating gate (or fully raised). PROG = Partially raised operating gate.

Table 4.--Gill Na^+-K^+ ATPase activity (µmol P_i · mg $Prot^{-1}$ · h^{-1}) for guided (gatewell) vs. unguided (fyke nets) chinook salmon at McNary Dam, 1992 (---- indicates samples collected were lost due to storage problems).

Age	Date	Na^+-K^+ ATPase (mean) Gatewell	Fyke nets
Yearling chinook	29 Apr	35.8	34.8
	30 Apr	31.9	28.5
	18 May	----	29.0
	19 May	34.0	31.1
	28 May	31.7	30.4
	29 May	27.9	33.9
Subyearling chinook	25 June	27.4	24.9
	26 June	----	24.7
	15 July	----	----
	16 July	----	----
	22 July	----	----
	23 July	----	----

Freezer storage problems destroyed almost all of the gill samples collected from subyearling chinook salmon (Table 4). For the first test date (25 June), subyearling chinook salmon gill Na^+-K^+ ATPase levels were the same for guided and unguided fish ($t = 0.82$, $df = 30$, $P = 0.420$).

The level of smolt development in yearling chinook salmon was relatively high and constant during the 1992 outmigration at McNary Dam, similar to the findings of Beeman et al. (1990) in 1989. The high FGE values obtained throughout the spring indicated that the degree of smolt development would probably have had little effect on yearling chinook salmon guidance with the extended-length screen. With consistently high gill Na^+-K^+ ATPase levels and FGE values, a strong correlation would be difficult to establish.

CONCLUSIONS

1) Extended-length submersible bar screens guided yearling and subyearling chinook salmon and steelhead significantly better than the STS at McNary Dam during spring and summer 1992. Mean fish guidance efficiency values for extended-length screens were 80 and 53% for the yearling and subyearling chinook salmon outmigrations, respectively, compared to 61 and 30% for the STS.
2) Lowering the extended-length bar screen 90 cm below the standard elevation resulted in lower FGE because fish passed through the gap between the turbine intake ceiling and the screen. Tests with a 60-cm lowered screen were limited in

number and did not appear to provide benefit over the standard elevation.

3) The extended-length bar screen at standard screen elevation, set at a 55° angle, with 30% perforated plate porosity, and a partially raised operating gate produced descaling rates similar to those with the STS for yearling chinook salmon (12.7 vs. 10.9%, respectively). These rates were lower than descaling rates with other extended-length bar screen configurations. Fish guidance efficiency for yearling chinook salmon was significantly higher with this extended-length bar screen configuration than with the STS (80 vs. 71%).

4) The extended-length bar screen at standard screen elevation, set at a 55° angle, with 30% perforated plate porosity, and no operating gate produced descaling rates for subyearling chinook salmon similar to descaling rates with the STS (6.6 vs. 5.1%, respectively). Fish guidance efficiency for subyearling chinook salmon was significantly higher with this extended-length bar screen configuration than with the STS (53 vs. 33%). No other combination of screen elevation, perforated plate porosity, and operating gate setting provided significantly higher guidance or lower descaling.

5) There was no significant difference in gill Na^+-K^+ ATPase levels between guided and unguided yearling chinook salmon at McNary Dam during spring 1992. During summer 1992, an inadequate sample size precluded a conclusion for subyearling chinook salmon.

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Appendix Table 1.--Numbers of fish caught, by species, for individual replicates of fish guidance efficiency (FGE) tests at McNary Dam, 1992.

27 April (5B)[a]

Location	Sub-yearling Chinook				Yearling Chinook				Steelhead				Coho				Sockeye			
	L	M	R	Tot[b]	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot
Level 1							1	1												
Level 2		1		1	6	3	7	16											2	2
Level 3		1		1	3	1	6	10			3	3								
Level 4					2	2	6	10						1		1	1			1
Level 5	1			1	6	1	2	9												
Level 6	3	2	4	9	2	1	3	6			1	1							1	1
Level 7					2	1		3		1		1								
Net total	4	4	4	12	21	9	25	55		1	4	5		1		1	1		3	4
Gatewell				6				227				14				8				42
Total				18				282				19				9				46
FGE				33.3				80.5				73.7				88.9				91.3

27 April (6B)

Location	Sub-yearling Chinook				Yearling Chinook				Steelhead				Coho				Sockeye			
	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot
Level 1		1		1	9	3	5	17	1			1					1			1
Level 2		1		1	2	2	8	12									1			1
Level 3					3	1	4	8												
Level 4					2		4	6												
Level 5	1			1	2		4	6												
Level 6		1		1			1	1												
Level 7																			2	2
Net total	1	3		4	18	6	26	50	1			1					2		2	4
Gatewell								96				6				1				6
Total				4				146				7				1				10
FGE				0.0				65.8				85.7				100				60.0

[a] Test date (test slot).
[b] Refers to fyke net column: L = left, M = middle, R = right, Tot = total catch for net level.

Appendix Table 1.--Continued.

28 April (5B)

Location	Sub-yearling Chinook				Yearling Chinook				Steelhead				Coho				Sockeye			
	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot
Level 1																				
Level 2	2			2	11	4	18	33	1			1					2	1	2	5
Level 3	3	2		5	3	2	4	9										1	1	2
Level 4	2			2	3	1	6	10										1	3	4
Level 5	1	1	1	3	2	5	8	15										1	1	2
Level 6	1	2	2	5	2	2	8	12	1			1						1		1
Level 7			1	1			1	1		1		1			1	1				
Net total	9	5	4	18	21	14	45	80	2	1		3			1	1	2	5	7	14
Gatewell								382				25				9				103
Total				18				462				28				10				117
FGE				0.0				82.7				89.3				90.0				88.0

28 April (6B)

Location	Sub-yearling Chinook				Yearling Chinook				Steelhead				Coho				Sockeye			
	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot
Level 1																	1		1	2
Level 2			3	3	6	1	6	13	1			1					1	1	2	4
Level 3					8	2	8	18									4		1	5
Level 4	2	1	1	4	1	4	3	8									1	1		2
Level 5	2	1	1	4	5	4	8	17		2		2					1			2
Level 6		1	1	2	5	2	5	12												
Level 7							1	1										1		1
Net total	4	3	6	13	25	13	31	69	1	2		3					8	3	4	15
Gatewell				3				369				32				9				83
Total				16				438				35				9				98
FGE				18.8				84.2				91.4				100				84.7

28 April (7B)

Location	Sub-yearling Chinook				Yearling Chinook				Steelhead				Coho				Sockeye			
	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot
Level 1																				
Level 2						8		24		1		3						1		3
Level 3		1		3		15		45										3		9
Level 4		3		9		16		48		1		3						2		6
Level 5		2		6		4		12										2		6
Level 6		1		3		1		3												
Level 7						1		3										1		3
Net total		7		21		45		135		2		6						9		27
Gatewell				5				152				15				5				38
Total				26				287				21				5				65
FGE				19.2				53.0				71.4				100				41.5

Appendix Table 1.--Continued.

29 April (5B)

Location	Sub-yearling Chinook				Yearling Chinook				Steelhead				Coho				Sockeye			
	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot
Level 1					1			1												
Level 2		2		2	4	1	7	12			1	1					3	1	4	8
Level 3			1	1	2	1	1	4										1	1	2
Level 4	1		3	4	1		3	4									2	2	2	6
Level 5			1	1	4	3	3	10	1			1					7	2	4	13
Level 6	3	1	2	6	3	5	8	16	1			1	2			2	2	1	5	8
Level 7		1	1	2	1			1												
Net total	4	4	8	16	16	10	22	48	2		1	3	2			2	14	7	16	37
Gatewell				4				137				38				3				108
Total				20				185				41				5				145
FGE				25.0				74.1				92.7				60.0				74.5

29 April (6B)

Location	Sub-yearling Chinook				Yearling Chinook				Steelhead				Coho				Sockeye			
	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot
Level 1																				
Level 2	1	1	2	4														1	1	2
Level 3					1			1											1	1
Level 4			1	1						1		1							2	2
Level 5		1	2	3	2		1	3									1	1	2	4
Level 6	1		2	3	1	1	1	3									1			1
Level 7			1	1																
Net total	2	2	8	12	4	1	2	7		1		1					2	2	6	10
Gatewell				2				64				18				4				47
Total				14				71				19				4				57
FGE				14.3				90.1				94.7				100				82.5

Appendix Table 1.--Continued.

30 April (5B)

Location	Sub-yearling Chinook				Yearling Chinook				Steelhead				Coho				Sockeye			
	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot
Level 1																				
Level 2					4	1	4	9							1	1	2		4	6
Level 3					4	2	6	12									3	1	2	6
Level 4					3		1	4			1	1						1	1	2
Level 5					4	3	4	11									1			1
Level 6			1	1	2			2												
Level 7																			1	1
Net total			1	1	17	6	15	38			1	1			1	1	6	2	8	16
Gatewell				5				263				46				25				161
Total				6				301				47				26				77
FGE				83.3				87.4				97.9				96.2				47.8

30 April (6B)

Location	Sub-yearling Chinook				Yearling Chinook				Steelhead				Coho				Sockeye			
	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot
Level 1							1	1											1	1
Level 2					5	1	8	14	1			1	1			1	7	3	6	16
Level 3							1	1			1	1						1	3	4
Level 4					3		3	6									4	2	3	9
Level 5					2	2	5	9		4	1	5					1	3	3	7
Level 6						4	2	6			1	1					1			1
Level 7																			2	2
Net total					10	7	20	37	1	4	3	8	1			1	13	9	18	40
Gatewell								171				31				16				160
Total								208				39				17				200
FGE								82.2				79.5				94.1				80.0

30 April (7B)

Location	Sub-yearling Chinook				Yearling Chinook				Steelhead				Coho				Sockeye			
	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot
Level 1																				
Level 2		1		3		5		15		1		3						7		21
Level 3						12		36		1		3						11		33
Level 4						10		30		1		3						8		24
Level 5						1		3										4		12
Level 6																		1		3
Level 7										1		3								
Net total		1		3		28		84		4		12						31		93
Gatewell								73				13				2				48
Total				3				157				25				2				141
FGE				0.0				46.5				52.0				100				34.0

Appendix Table 1.--Continued.

4 May (5B)

Location	Sub-yearling Chinook				Yearling Chinook				Steelhead				Coho				Sockeye			
	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot
Level 1							1	1										1		1
Level 2					4	1	23	28							1	1	9		4	13
Level 3					5		4	9		1		1					4	3	3	10
Level 4					3		11	14			1	1					4	1	3	8
Level 5	1		1	2	2	2	8	12			2	2			1	1			1	1
Level 6			3	3	3	3	6	12	1	1	2	4	1		1	2	1	1	2	4
Level 7					2			2			1	1					2			2
Net total	1		4	5	19	6	53	78	1	2	6	9	1		3	4	20	6	13	39
Gatewell				5				487				109				94				444
Total				10				565				118				98				483
FGE				50.5				86.2				92.4				95.9				91.9

4 May (6B)

Location	Sub-yearling Chinook				Yearling Chinook				Steelhead				Coho				Sockeye			
	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot
Level 1			1	1			1	1			1	1					1		1	2
Level 2	1			1	2	2	4	8		1		1					2	1	2	5
Level 3					1	1	2	4		2		2					1	1	5	7
Level 4							2	2		1		1		2		2	4	2	3	9
Level 5		1		1	4		1	5	2			2			1	1	1		1	2
Level 6					1	2	1	4	1	1		2							1	1
Level 7							1	1									1	1		2
Net total	1	1	1	3	8	5	12	25	3	5	1	9		2	1	3	10	5	13	28
Gatewell								80				28				18				44
Total				3				105				37				21				72
FGE				0.0				76.2				75.7				85.7				61.1

Appendix Table 1.--Continued.

5 May (5B)

Location	Sub-yearling Chinook				Yearling Chinook				Steelhead				Coho				Sockeye			
	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot
Level 1							1	1										1		1
Level 2					13	21	39	73	1			1	1			1	6	4	8	18
Level 3					5	2	9	16					1			1			4	4
Level 4					5	2	9	16	1			1	1			1	2		2	4
Level 5					5	3	6	14		1		1					2	1	1	4
Level 6			2	2	1	5	8	14			1	1	1	1		2	2		2	4
Level 7		1	1	2	3			3										1	2	3
Net total		1	3	4	32	33	72	137	2	1	1	4	4	1		5	12	7	19	38
Gatewell				5				646				24				26				153
Total				9				783				28				31				191
FGE				55.6				82.5				85.7				83.9				80.1

5 May (6B)

Location	Sub-yearling Chinook				Yearling Chinook				Steelhead				Coho				Sockeye			
	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot
Level 1																	2			2
Level 2					7	2	7	16		1		1	1			1	5		9	14
Level 3					1	2	2	5		1		1					1	1	2	4
Level 4					4	1	3	8	1		1	2					1	3	1	5
Level 5					7	4	6	17									2	3	3	8
Level 6						2		2												
Level 7			1	1																
Net total			1	1	19	11	18	48	1	2	1	4	1			1	11	7	15	33
Gatewell				1				202				13				31				76
Total				2				250				17				32				109
FGE				50.0				80.8				76.5				96.9				69.7

5 May (7B)

Location	Sub-yearling Chinook				Yearling Chinook				Steelhead				Coho				Sockeye			
	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot
Level 1																				
Level 2		1		3		6		18										6		18
Level 3						23		69		2		6						14		42
Level 4						20		69		1		3		1		3		9		27
Level 5						5		15						1		3		6		18
Level 6																				
Level 7																				
Net total		1		3		54		162		3		9		2		6		35		105
Gatewell				2				90				6				22				51
Total				5				252				15				28				156
FGE				40.0				36.5				40.0				78.6				32.7

Appendix Table 1.--Continued.

6 May (5B)

Location	Sub-yearling Chinook				Yearling Chinook				Steelhead				Coho				Sockeye			
	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot
Level 1					3			3												
Level 2					20	17	46	83										2	6	8
Level 3					9	3	11	23		1		1					3	1		4
Level 4	2			2	6	2	10	18									2		2	4
Level 5		1	1	2	13	6	19	38					1			1		3		3
Level 6	1			1	6	4	11	21		1	1	2		1		1	2	1		3
Level 7						2	2	4						1		1				
Net total	3	1	1	5	57	34	99	190		2	1	3	1	2		3	7	7	8	22
Gatewell				2				664				44				10				66
Total				7				854				47				13				88
FGE				28.6				77.8				93.6				76.9				75.0

6 May (6B)

Location	Sub-yearling Chinook				Yearling Chinook				Steelhead				Coho				Sockeye			
	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot
Level 1						1		1												
Level 2		1		1	7	4	15	26	1		1	2					3	1	7	11
Level 3					5	4	10	19			1	1					7	2	3	12
Level 4		1		1	5	4	8	17									6	6	7	19
Level 5			1	1	18	6	14	38		2		2			1	1	4	9	4	17
Level 6	1	1		2	7	3	11	21									3	6	1	10
Level 7																				
Net total	1	3	1	5	42	22	58	122	1	2	2	5			1	1	23	24	22	69
Gatewell				2				383				27				22				69
Total				7				505				32				23				138
FGE				28.6				75.8				53.1				95.7				50.0

Appendix Table 1.--Continued.

7 May (5B)

Location	Sub-yearling Chinook				Yearling Chinook				Steelhead				Coho				Sockeye			
	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot
Level 1						1		1												
Level 2					9	3	16	28									6	1	4	11
Level 3					6	3	8	17									1	1	3	5
Level 4					2	1	4	7										1		1
Level 5			2	2	8	5	13	26			1	1					1	2	1	4
Level 6		3	1	4	1			1											2	2
Level 7		1		1			1	1		1		1							2	2
Net total		4	3	7	26	13	42	81		1	1	2					8	5	12	25
Gatewell								396				47				4				72
Total				7				477				49				4				97
FGE				0.0				83.0				95.9				100				74.2

7 May (6B)

Location	Sub-yearling Chinook				Yearling Chinook				Steelhead				Coho				Sockeye			
	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot
Level 1																				
Level 2					1	4	15	20	1			1					4			4
Level 3					2		6	8											2	2
Level 4			2	2	4	4	7	15	1			1					5	1	2	8
Level 5			1	1	9	3	5	17		1		1						1	1	2
Level 6					2	3	2	7			1	1						2		2
Level 7							1	1												
Net total			3	3	18	14	36	68	2	1	1	4					9	4	5	18
Gatewell				1				248				18				2				42
Total				4				316				22				2				60
FGE				25.0				78.5				81.8				100				70.0

7 May (7B)

Location	Sub-yearling Chinook				Yearling Chinook				Steelhead				Coho				Sockeye			
	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot
Level 1																				
Level 2						4		12										2		6
Level 3						10		30						1		3		5		15
Level 4						7		21		1		3						2		6
Level 5		1		3														2		6
Level 6						1		3												
Level 7																				
Net total		1		3		22		66		1		3		1		3		11		33
Gatewell								159				14				20				16
Total				3				225				17				23				49
FGE				0.0				70.7				82.4				87.0				32.7

Appendix Table 1.--Continued.

8 May (5B)

Location	Sub-yearling Chinook				Yearling Chinook				Steelhead				Coho				Sockeye			
	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot
Level 1					1			1												
Level 2					10	3	12	25		1	1	2					4			4
Level 3		1		1	12	1	5	18		1	1	2						1	1	2
Level 4					2	3	10	15									2	1	2	5
Level 5	1			1	10	3	5	18		1	1	2						2	1	3
Level 6		1		1	5	5	5	15		1		1					1	2	1	4
Level 7					1	2	2	5												
Net total	1	2		3	41	17	39	97		4	3	7					7	6	5	18
Gatewell								457				54				18				81
Total				3				554				61				18				99
FGE				100				82.5				88.5				100				81.8

8 May (6B)

Location	Sub-yearling Chinook				Yearling Chinook				Steelhead				Coho				Sockeye			
	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot
Level 1																				
Level 2					5	1	8	14									1	2	1	4
Level 3					2	1	7	10									5	3	3	11
Level 4					3		7	10			2	2					1	3	3	7
Level 5					4	6	9	19		1	2	3					5	4	2	11
Level 6					4	2	3	9	1		1	2					1	3	2	6
Level 7					1		1	2	2			2						1		1
Net total					19	10	35	64	3	1	5	9					13	16	11	40
Gatewell				1				453				72				21				119
Total				1				517				81				21				159
FGE				100				87.6				88.9				100				74.8

Appendix Table 1.--Continued.

18 May (5B)

Location	Sub-yearling Chinook				Yearling Chinook				Steelhead				Coho				Sockeye			
	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot
Level 1									1			1								
Level 2			1	1	3		3	6											1	1
Level 3	1			1	1	2	2	5	1	1		2							3	2
Level 4		1		1	7	3	6	16			2	2						3	4	7
Level 5	3	1		4	2	7	5	14		1	1	2	1			1	1	4	3	8
Level 6					2	1	8	11										2	1	3
Level 7					2			2												
Net total	4	2	1	7	17	13	24	54	2	2	3	7	1			1	1	9	12	22
Gatewell				4				169				53				11				11
Total				11				223				60				12				33
FGE				36.4				75.8				88.3				91.7				33.3

18 May (6B)

Location	Sub-yearling Chinook				Yearling Chinook				Steelhead				Coho				Sockeye			
	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot
Level 1					1			1												
Level 2					1		4	5									1	1	1	3
Level 3			1	1			1	1									1	1	2	4
Level 4						5	1	6										1	1	2
Level 5					5	1	5	11							1	1		2	5	7
Level 6					3	1	2	6		1		1					1			1
Level 7					1	1		2	1			1								
Net total			1	1	11	8	13	32	1	1		2			1	1	3	5	9	17
Gatewell				3				125				20				4				11
Total				4				157				22				5				28
FGE				75.0				79.6				90.9				80.0				39.3

Appendix Table 1.--Continued.

19 May (5B)

Location	Sub-yearling Chinook				Yearling Chinook				Steelhead				Coho				Sockeye			
	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot
Level 1																				
Level 2			1	1	2	3	6	11	2		1	3								
Level 3					4		6	10	1			1	1	1		2	1			1
Level 4	1			1	2	5	6	13	1		1	2					1	2	2	5
Level 5					11	6	7	24		1		1								
Level 6						6	4	10												
Level 7						1		1												
Net total	1		1	2	19	21	29	69	4	1	2	7	1	1		2	2	2	2	6
Gatewell				2				175				46				18				14
Total				4				244				53				20				20
FGE				50.0				71.7				86.8				90.0				70.0

19 May (6B)

Location	Sub-yearling Chinook				Yearling Chinook				Steelhead				Coho				Sockeye			
	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot
Level 1					2	2	1	5		1		1								
Level 2					3	1	7	11												
Level 3					4	2	2	8									1	1		2
Level 4	1	1		2	7		2	9		1		1					1		1	2
Level 5		1		1	4	5	3	12		1		1						1		1
Level 6					1	1	1	3												
Level 7																				
Net total	1	2		3	21	11	16	48		2	1	3					2	2	1	5
Gatewell				2				245				53				16				14
Total				5				293				56				16				19
FGE				40.0				83.6				94.6				100				73.7

19 May (7B)

Location	Sub-yearling Chinook				Yearling Chinook				Steelhead				Coho				Sockeye			
	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot
Level 1																				
Level 2						2		6												
Level 3						2		6		1		3								
Level 4						3		9		1		3								
Level 5						1		3		1		3								
Level 6						1		3												
Level 7						1		3		1		3								
Net total						10		30		4		12								
Gatewell								299				36				8				4
Total								329				48				8				4
FGE								90.9				75.0				100				100

Appendix Table 1.--Continued.

20 May (5B)

Location	Sub-yearling Chinook				Yearling Chinook				Steelhead				Coho				Sockeye			
	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot
Level 1																				
Level 2					5	2	17	24									2	1	2	5
Level 3	1			1	4	2	6	12		1	2	3					3		2	5
Level 4	1			1	4	5	6	15	1	2	1	4		1		1	2	2	1	5
Level 5					6	7	5	18	3		2	5					1	3	1	5
Level 6					1	4	4	9			6	6							1	1
Level 7					2		1	3		1		1								
Net total	2			2	22	20	39	81	4	4	11	19		1		1	8	6	7	21
Gatewell				2				308				47				34				33
Total				4				389				66				35				54
FGE				50.0				79.2				71.2				97.1				61.1

20 May (6B)

Location	Sub-yearling Chinook				Yearling Chinook				Steelhead				Coho				Sockeye			
	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot
Level 1					1			1												
Level 2					1			1		1		1							4	4
Level 3						2	4	6		2	1	3					1		1	2
Level 4					1	2	5	8			2	2					3	3	4	10
Level 5	1			1	5	8	4	17	2	1		3			2	2	1		1	2
Level 6						1	2	3		1		1								
Level 7							1	1												
Net total	1			1	8	13	16	37	2	5	3	10			2	2	5	3	10	18
Gatewell				2				218				44				32				19
Total				3				255				54				34				37
FGE				66.7				85.5				81.5				94.1				51.4

Appendix Table 1.--Continued.

21 May (5B)

Location	Sub-yearling Chinook				Yearling Chinook				Steelhead				Coho				Sockeye			
	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot
Level 1					1		1	2												
Level 2					1	2	10	13		1	2	3	1			1		1	1	2
Level 3					3		4	7			1	1					3	1	2	6
Level 4					7	3	8	18	2	1		3					1		1	2
Level 5		2		2	7	3	6	16	1	1	2	4		2		2				
Level 6					3	2	3	8		1		1								
Level 7											1	1								
Net total		2		2	22	10	32	64	3	4	6	13	1	2		3	4	2	4	10
Gatewell				6				231				68				35				25
Total				8				295				81				38				35
FGE				75.0				78.3				84.0				92.1				71.4

21 May (6B)

Location	Sub-yearling Chinook				Yearling Chinook				Steelhead				Coho				Sockeye			
	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot
Level 1									1			1								
Level 2					6	1	3	10		2	2	4					1			1
Level 3					3		2	5									2			2
Level 4			1	1	7	2	9	18		1	1	2	1			1	2	1	1	4
Level 5	1			1	8	7	6	21		2	2	4					3	4	3	10
Level 6	1			1	5	5	1	11			1	1			1	1		1	3	4
Level 7					1			1												
Net total	2		1	3	30	15	21	66	1	5	6	12	1		1	2	8	6	7	21
Gatewell				4				279				58				43				21
Total				7				345				70				45				42
FGE				57.1				80.1				82.9				95.6				50.0

21 May (7B)

Location	Sub-yearling Chinook				Yearling Chinook				Steelhead				Coho				Sockeye			
	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot
Level 1																				
Level 2						6		18						1		3		1		3
Level 3						21		63		1		3						2		6
Level 4		1		3		15		45		2		6		1		3		8		24
Level 5		1		3		7		21						2		6		2		6
Level 6						1		3										2		6
Level 7																				
Net total		2		6		50		150		3		9		4		12		15		45
Gatewell				5				277				59				43				13
Total				11				427				68				55				58
FGE				45.5				64.9				86.8				78.2				22.4

Appendix Table 1.--Continued.

26 May (5B)

Location	Sub-yearling Chinook				Yearling Chinook				Steelhead				Coho				Sockeye			
	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot
Level 1																				
Level 2	1			1	3	2	3	8												
Level 3					2	2	3	7											2	2
Level 4					2	2	5	9									1		1	2
Level 5		1		1	2	7	9	18	1			1	1		1	2			1	1
Level 6					2		4	6							2	2				
Level 7						1		1												
Net total	1	1		2	11	14	24	49	1			1	1		3	4	1		4	5
Gatewell				3				118				21				49				10
Total				5				167				22				53				15
FGE				60.0				70.7				95.5				35.9				66.7

26 May (6B)

Location	Sub-yearling Chinook				Yearling Chinook				Steelhead				Coho				Sockeye			
	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot
Level 1																				
Level 2					1			1												
Level 3					1			1												
Level 4		2		2	2		1	3									1			1
Level 5						2	2	4											1	1
Level 6					3		1	4												
Level 7																			1	1
Net total		2		2	7	2	4	13									1		2	3
Gatewell				2				69				15				18				8
Total				4				82				15				18				11
FGE				50.0				84.2				100				100				72.7

26 May (7B)

Location	Sub-yearling Chinook				Yearling Chinook				Steelhead				Coho				Sockeye			
	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot
Level 1																				
Level 2														1		3				
Level 3						3		9						1		3				
Level 4						3		9												
Level 5																				
Level 6																				
Level 7																				
Net total						6		18						2		6				
Gatewell				1				36				9				11				1
Total				1				54				9				17				1
FGE				100				66.7				100				64.7				100

Appendix Table 1.--Continued.

27 May (5B)

Location	Sub-yearling Chinook				Yearling Chinook				Steelhead				Coho				Sockeye			
	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot
Level 1	1			1																
Level 2	1		2	3	3	2	7	12												
Level 3		1		1	3	2	4	9		1	1	2					1			1
Level 4		1		1	5	2	3	10									1	1		2
Level 5		1		1	1	1	4	6		1		1		1		1	1			1
Level 6			1	1	1	3	1	5					1			1				
Level 7					1			1												
Net total	2	3	2	8	14	10	19	43		2	1	3	1	1		2	3	1		4
Gatewell				6				162				62				47				6
Total				14				205				65				49				10
FGE				42.9				79.0				95.4				95.9				60.0

27 May (6B)

Location	Sub-yearling Chinook				Yearling Chinook				Steelhead				Coho				Sockeye			
	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot
Level 1							1	1												
Level 2					4	2	4	10			1	1								
Level 3			1	1	2	1	4	7												
Level 4		1	1	2	2			2	1	1		2								
Level 5		2		2	3		8	11		1		1					1			1
Level 6					1		3	4			1	1						1	1	2
Level 7						1		1												
Net total		3	2	5	12	4	20	36	1	2	2	5					1	1	1	3
Gatewell				14				153				64				38				2
Total				19				189				69				38				5
FGE				73.7				81.0				92.8				100				40.0

Appendix Table 1.--Continued.

28 May (5B)

Location	Sub-yearling Chinook				Yearling Chinook				Steelhead				Coho				Sockeye			
	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot
Level 1			1	1																
Level 2			1	1	1		2	3												
Level 3					5	2	1	8						1		1	2			2
Level 4			1	1	5	1	1	7	1			1			1	1				
Level 5					5	2	8	15			1	1	2			1	1			1
Level 6							2	2		1		1	2			2				
Level 7																				
Net total			3	3	16	5	14	35	1	1	1	3	4	1	1	6	3			3
Gatewell				5				99				26				40				9
Total				8				134				29				46				12
FGE				62.5				73.9				86.7				87.0				75.0

28 May (6B)

Location	Sub-yearling Chinook				Yearling Chinook				Steelhead				Coho				Sockeye			
	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot
Level 1																				
Level 2																			1	1
Level 3			1	1					1			1						1		1
Level 4			1	1	1		1	2			1	1						1		1
Level 5			2	2	6		3	9	1		1	2							1	1
Level 6	1			1	1	1		2	2									1		1
Level 7																				
Net total	1		4	5	8	1	4	13	4		2	6						3	2	5
Gatewell				6				54				34				48				4
Total				11				67				40				48				9
FGE				45.5				80.7				85.0				100				44.4

28 May (7B)

Location	Sub-yearling Chinook				Yearling Chinook				Steelhead				Coho				Sockeye			
	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot
Level 1																				
Level 2						1		3												
Level 3		1		3		2		6										1		3
Level 4		3		9		4		12						1		3		1		3
Level 5																				
Level 6										1		3								
Level 7																				
Net total		4		12		7		21		1		3		1		3		2		6
Gatewell				7				32				25				45				3
Total				19				53				28				48				9
FGE				36.8				59.3				89.3				93.8				33.3

Appendix Table 1.--Continued.

29 May (5B)

Location	Sub-yearling Chinook				Yearling Chinook				Steelhead				Coho				Sockeye			
	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot
Level 1																				
Level 2					1	2	3	6							2	2				
Level 3			1	1	3	1	2	6		1		1			1	1	1		1	2
Level 4	1		1	2	5	2	5	12					2			2			1	1
Level 5					2	4	6	12										2	1	3
Level 6					1			1			1	1								
Level 7																				
Net total	1		2	3	12	9	16	37		1	1	2	2		3	5	1	2	3	6
Gatewell				5				115				41				83				4
Total				8				152				43				88				10
FGE				62.5				75.7				95.4				94.3				40.0

29 May (6B)

Location	Sub-yearling Chinook				Yearling Chinook				Steelhead				Coho				Sockeye			
	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot
Level 1						1		1												
Level 2					2		1	3							1	1		1	1	2
Level 3							4	4											1	1
Level 4		1		1	7	2	2	11	1	1		2		1		1			1	1
Level 5					5	4	1	10			1	1					2		1	3
Level 6		1	1	2	1	3	1	5												
Level 7					1			1												
Net total		2	1	3	16	10	9	35	1	1	1	3		1	1	2	2	1	4	7
Gatewell				4				69				30				35				9
Total				7				104				33				37				16
FGE				57.1				66.4				90.9				94.6				56.3

Appendix Table 1.--Continued.

22 June (5B)

Location	Sub-yearling Chinook				Yearling Chinook				Steelhead				Coho				Sockeye			
	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot
Level 1	2	3		5			2	2												
Level 2	42	37	57	136	1		2	3												
Level 3	31	20	33	84	1			1												
Level 4	39	33	47	119			1	1												
Level 5	42	69	65	176	1			1												
Level 6	4	7	21	32		1		1												
Level 7	1	4	11	16			4	4												
Net total	161	173	234	568	3	1	9	13												
Gatewell				1484				8				2								1
Total				2052				21				2								1
FGE				72.3				38.1				100								100

22 June (6B)

Location	Sub-yearling Chinook				Yearling Chinook				Steelhead				Coho				Sockeye			
	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot
Level 1	2	1	1	4																
Level 2	21	7	25	53	1			1												
Level 3	7	7	10	24																
Level 4	16	15	17	48																
Level 5	20	20	13	53																
Level 6	4	5	4	13																
Level 7																				
Net total	70	55	70	195	1			1												
Gatewell				535								2								1
Total				730				1				2								1
FGE				73.3				0.0				100								100

Appendix Table 1.--Continued.

23 June (5B)

Location	Sub-yearling Chinook				Yearling Chinook				Steelhead				Coho				Sockeye			
	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot
Level 1	1	1	3	5																
Level 2	13	4	14	31	1			1												
Level 3	2	2	12	16																
Level 4	2	5	8	15																
Level 5	5	6	17	28	2		1	3												
Level 6	1	2	1	4																
Level 7																				
Net total	24	20	55	99	3		1	4												
Gatewell				411				3				2								
Total				510				7				2								
FGE				80.1				42.9				100								

23 June (6B)

Location	Sub-yearling Chinook				Yearling Chinook				Steelhead				Coho				Sockeye			
	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot
Level 1	5			5																
Level 2	1	3	8	12	1			1												
Level 3	8	3	10	21																
Level 4	13	8	6	27	1			1												
Level 5		8	10	18																
Level 6	2	1	5	8																
Level 7																				
Net total	29	23	39	91	2			2												
Gatewell				304				2												1
Total				395				4												1
FGE				77.0				50.0												100

23 June (7B)

Location	Sub-yearling Chinook				Yearling Chinook				Steelhead				Coho				Sockeye			
	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot
Level 1																				
Level 2		17		51																
Level 3		18		54																
Level 4		19		57																
Level 5		6		18																
Level 6		3		9																
Level 7																				
Net total		63		189																
Gatewell				414																
Total				603																
FGE				68.7																

Appendix Table 1.--Continued.

24 June (5B)

Location	Sub-yearling Chinook				Yearling Chinook				Steelhead				Coho				Sockeye			
	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot
Level 1	1	1		2																
Level 2	27	12	29	68																
Level 3	10	6	14	30																
Level 4	12	9	8	29																
Level 5	8	2	10	20																
Level 6	2	4	3	9																
Level 7		1		1																
Net total	60	35	64	159																
Gatewell				548				2				2								
Total				707				2				2								
FGE				77.5																

24 June (6B)

Location	Sub-yearling Chinook				Yearling Chinook				Steelhead				Coho				Sockeye			
	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot
Level 1																				
Level 2	11	3	8	22																
Level 3	4	5	3	12																
Level 4	4	16	10	30																
Level 5	10	9	8	27																
Level 6	1	1		2																
Level 7		1		1																
Net total	30	34	30	94																
Gatewell				239			1				1				1					
Total				333			1				1				1					
FGE				71.8			100													

Appendix Table 1.--Continued.

25 June (5B)

Location	Sub-yearling Chinook				Yearling Chinook				Steelhead				Coho				Sockeye			
	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot
Level 1	3			3																
Level 2	13	9	15	37																
Level 3	9	2	7	18																
Level 4	14	8	13	35	1			1												
Level 5	15	9	12	36			1	1												
Level 6	7	2		9																
Level 7			1	1																
Net total	61	30	48	139	1		1	2												
Gatewell				292				2				1								
Total				431				4				1								
FGE				67.8				50.0				100								

25 June (6B)

Location	Sub-yearling Chinook				Yearling Chinook				Steelhead				Coho				Sockeye			
	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot
Level 1			1	1																
Level 2	2	5	3	10	1			1												
Level 3	5	6	6	17		1		1												
Level 4	10	7	7	24																
Level 5	12	10	13	35																
Level 6	1	3	2	6																
Level 7																				
Net total	30	31	32	93				2												
Gatewell				140																
Total				233				2												
FGE				60.1				0.0												

25 June (7B)

Location	Sub-yearling Chinook				Yearling Chinook				Steelhead				Coho				Sockeye			
	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot
Level 1																				
Level 2		10		30																
Level 3		23		69																
Level 4		35		105																
Level 5		23		69																
Level 6		11		33																
Level 7		8		24																
Net total		110		330																
Gatewell				367				3												
Total				697				3												
FGE				52.7				100												

Appendix Table 1.--Continued.

26 June (5B)

Location	Sub-yearling Chinook				Yearling Chinook				Steelhead				Coho				Sockeye			
	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot
Level 1	9	4	4	17																
Level 2	102	74	163	339																
Level 3	53	28	83	164			1	1												
Level 4	83	59	67	209	1	1		2												
Level 5	97	91	79	267	2	1		3												
Level 6	23	12	27	62																
Level 7	2		3	5																
Net total	369	268	426	1063	3	2	1	6												
Gatewell				2760				6				1								
Total				3823				12				1								
FGE				72.2				50.0				100								

26 June (6B)

Location	Sub-yearling Chinook				Yearling Chinook				Steelhead				Coho				Sockeye			
	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot
Level 1	1	4	6	11																
Level 2	27	31	40	98																
Level 3	41	23	34	98																
Level 4	69	44	68	181																
Level 5	67	75	79	221																
Level 6	21	7	19	49																
Level 7	2	4		6																
Net total	228	188	246	664																
Gatewell				1106																2
Total				1770																2
FGE				62.5																100

Appendix Table 1.--Continued.

27 June (5B)

Location	Sub-yearling Chinook				Yearling Chinook				Steelhead				Coho				Sockeye			
	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot
Level 1	6	1	5	12																
Level 2	86	32	48	166	1			1												
Level 3	32	17	37	86																
Level 4	36	26	30	92	1			1												
Level 5	34	54	40	128	1	1		2												
Level 6	12	15	16	43																
Level 7	1	1	5	7																
Net total	207	146	181	534	3	1		4												
Gatewell				958				4												1
Total				1492				8												1
FGE				64.2				50.0												100

27 June (6B)

Location	Sub-yearling Chinook				Yearling Chinook				Steelhead				Coho				Sockeye			
	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot
Level 1			1	1																
Level 2	8	4	14	26																
Level 3	9	15	12	36																
Level 4	9	14	16	39																
Level 5	16	11	36	63																
Level 6	6	6	6	18																
Level 7																				
Net total	48	50	85	183																
Gatewell				332																
Total				515																
FGE				64.5																

27 June (7B)

Location	Sub-yearling Chinook				Yearling Chinook				Steelhead				Coho				Sockeye			
	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot
Level 1		1		3																
Level 2		12		36																
Level 3		13		39																
Level 4		28		84																
Level 5		30		90																
Level 6		14		42																
Level 7																				
Net total		98		294																
Gatewell				911				1												1
Total				1205				1												1
FGE				75.6				100												100

Appendix Table 1.--Continued.

28 June (5B)

Location	Sub-yearling Chinook				Yearling Chinook				Steelhead				Coho				Sockeye			
	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot
Level 1	1	1		2																
Level 2	17	12	14	43																
Level 3	19	14	12	45																
Level 4	41	40	34	115																
Level 5	36	45	55	136	1			1												
Level 6	9	11	10	30																
Level 7	1			1																
Net total	124	123	125	372	1			1												
Gatewell				432				4				1								1
Total				804				5				1								1
FGE				53.7				80.0				100								100

28 June (6B)

Location	Sub-yearling Chinook				Yearling Chinook				Steelhead				Coho				Sockeye			
	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot
Level 1			2	2																
Level 2	6	1	9	16																
Level 3	11	11	16	38																
Level 4	26	28	35	89																
Level 5	38	38	37	113																
Level 6	7	3	6	16																
Level 7			1	1																
Net total	88	81	106	275																
Gatewell				348				2				2								
Total				623				2				2								
FGE				55.9				100				100								

28 June (7B)

Location	Sub-yearling Chinook				Yearling Chinook				Steelhead				Coho				Sockeye			
	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot
Level 1																				
Level 2		7		21																
Level 3		20		60																
Level 4		7		21																
Level 5		5		15																
Level 6		4		12																
Level 7		2		6																
Net total		45		135																
Gatewell				49																
Total				184																
FGE				26.6																

Appendix Table 1.--Continued.

29 June (5B)

Location	Sub-yearling Chinook				Yearling Chinook				Steelhead				Coho				Sockeye			
	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot
Level 1	2			2																
Level 2	23	16	24	63																
Level 3	17	11	17	45																
Level 4	27	32	29	88																
Level 5	46	57	57	160																
Level 6	8	14	13	35																
Level 7	2	1		3																
Net total	125	131	140	396																
Gatewell				481				1				2								
Total				877				1				2								
FGE				54.9				100				100								

29 June (6B)

Location	Sub-yearling Chinook				Yearling Chinook				Steelhead				Coho				Sockeye			
	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot
Level 1	1	1	2	4																
Level 2	8	3	15	26																
Level 3	7	8	10	25																
Level 4	31	27	27	85																
Level 5	43	34	41	118																
Level 6	9	2	8	19																
Level 7			4	4																
Net total	99	75	107	281																
Gatewell				408																
Total				689																
FGE				59.2																

29 June (7B)

Location	Sub-yearling Chinook				Yearling Chinook				Steelhead				Coho				Sockeye			
	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot
Level 1		1		3																
Level 2		26		78																
Level 3		36		108																
Level 4		33		99		1		3												
Level 5		11		33																
Level 6		4		12																
Level 7																				
Net total		111		333		1		3												
Gatewell				203								2								
Total				536				3				2								
FGE				37.9				0.0				100								

Appendix Table 1.--Continued.

6 July (6B)

Location	Sub-yearling Chinook				Yearling Chinook				Steelhead				Coho				Sockeye			
	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot
Level 1		2		2																
Level 2	3	3	7	13						1		1								
Level 3	4	4	12	20																
Level 4	33	32	17	82		2	2	4			1	1								
Level 5	29	44	39	112	1			1	1			1								
Level 6	23	20	34	77							1	1								
Level 7	2	6	1	9																
Net total	94	111	110	315	1	2	2	5	1	1	2	4								
Gatewell				82								2								
Total				397				5				6								
FGE				20.7				0.0				33.3								

Appendix Table 1.--Continued.

7 July (6B)

Location	Sub-yearling Chinook				Yearling Chinook				Steelhead				Coho				Sockeye			
	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot
Level 1																				
Level 2	5	2	6	13					1		1	2								
Level 3	4	4	7	15																
Level 4	15	12	21	48	1	1		2												
Level 5	27	34	23	84																
Level 6	19	20	19	58	2	1		3		1		1								
Level 7	3		1	4																
Net total	73	72	77	222	3	2		5	1	1	1	3								
Gatewell				144				2				6								
Total				366				7				9								
FGE				39.4				28.6				66.7								

7 July (7B)

Location	Sub-yearling Chinook				Yearling Chinook				Steelhead				Coho				Sockeye			
	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot
Level 1		1		3																
Level 2		9		27						1		3								
Level 3		34		102		1		3												
Level 4		42		126																
Level 5		27		81																
Level 6		8		24																
Level 7		3		9																
Net total		124		372		1		3		1		3								
Gatewell				93				4				9								
Total				465				7				12								
FGE				20.0				57.1				75.0								

Appendix Table 1.--Continued.

8 July (6B)

Location	Sub-yearling Chinook				Yearling Chinook				Steelhead				Coho				Sockeye			
	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot
Level 1			1	1																
Level 2	1	1	6	8																
Level 3	8	5	9	22						2		2								
Level 4	17	9	6	32	1			1	1	1		2								
Level 5	18	18	27	63		1		1												
Level 6	12	7	7	26	1			1												
Level 7	1			1																
Net total	57	40	56	153	2	1		3	1	3		4								
Gatewell				117								6								
Total				270				3				10								
FGE				43.3				0.0				60.0								

8 July (7B)

Location	Sub-yearling Chinook				Yearling Chinook				Steelhead				Coho				Sockeye			
	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot
Level 1																				
Level 2		4		12																
Level 3		14		42																
Level 4		25		75		1		3												
Level 5		17		51																
Level 6		4		12																
Level 7																				
Net total		64		192		1		3												
Gatewell				47				1												
Total				239				4												
FGE				19.7				25.0												

Appendix Table 1.--Continued.

9 July (6B)

Location	Sub-yearling Chinook				Yearling Chinook				Steelhead				Coho				Sockeye			
	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot
Level 1	4			4																
Level 2	10	12	15	37																
Level 3	16	17	20	53			2	2												
Level 4	28	28	31	87																
Level 5	42	56	56	154	1		2	3												
Level 6	20	20	23	63	2			2												
Level 7	4	3	5	12																
Net total	124	136	150	410	3		4	7												
Gatewell				288				2				3								
Total				698				9				3								
FGE				41.3				22.2				100								

9 July (7B)

Location	Sub-yearling Chinook				Yearling Chinook				Steelhead				Coho				Sockeye			
	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot
Level 1																				
Level 2		28		84																
Level 3		57		171		1		3												
Level 4		101		303		1		3		1		3								
Level 5		53		159		4		12		1		3								
Level 6		8		24																
Level 7		3		9						1		3								
Net total		250		750		6		18		3		9								
Gatewell				195				2				7								
Total				945				20				16								
FGE				20.6				10.0				43.8								

Appendix Table 1.--Continued.

10 July (6B)

Location	Sub-yearling Chinook				Yearling Chinook				Steelhead				Coho				Sockeye			
	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot
Level 1			1	1					1			1								
Level 2	7	8	7	22	2			2	1		1	2								
Level 3	23	26	30	79					1	2	3	6								
Level 4	73	57	73	203	1	2	6	9	3	1	1	5								
Level 5	114	112	68	294	2	1	2	5	4	1	2	7								
Level 6	63	62	32	157	3	1	2	6		2	3	5								
Level 7	7	4	4	15					1			1								
Net total	287	269	215	771	8	4	10	22	11	6	10	27								
Gatewell				226				16				52								
Total				997				38				79								
FGE				22.7				42.1				65.8								

10 July (7B)

Location	Sub-yearling Chinook				Yearling Chinook				Steelhead				Coho				Sockeye			
	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot
Level 1		2		6																
Level 2		34		102		1		3		1		3								
Level 3		66		198		2		6		3		9								
Level 4		100		300		4		12		2		6								
Level 5		78		234		2		6		1		3								
Level 6		36		108		1		3												
Level 7		7		21						7		21								
Net total		323		969		10		30												
Gatewell				195				3				32								
Total				1164				33				53								
FGE				16.8				9.1				60.4								

Appendix Table 1.--Continued.

11 July (6B)

Location	Sub-yearling Chinook				Yearling Chinook				Steelhead				Coho				Sockeye			
	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot
Level 1	1		4	5																
Level 2	11	14	18	43			1	1	1			1								
Level 3	22	20	22	64	1	1		2												
Level 4	80	62	64	206	1			1												
Level 5	88	92	71	251		1	2	3												
Level 6	34	21	32	87		1	2	3												
Level 7	2		5	7		1		1												
Net total	238	209	216	663	2	4	5	11	1			1								
Gatewell				360				7				17								
Total				1022				18				18								
FGE				35.2				38.9				94.4								

11 July (7B)

Location	Sub-yearling Chinook				Yearling Chinook				Steelhead				Coho				Sockeye			
	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot
Level 1		2		6						1		3								
Level 2		43		129		2		6												
Level 3		59		177		2		6												
Level 4		108		324		2		6												
Level 5		27		81																
Level 6		6		18																
Level 7		1		3																
Net total		246		738		6		18		1		3								
Gatewell				267				7				8								
Total				1005				25				11								
FGE				26.6				28.0				72.7								

Appendix Table 1.--Continued.

13 July (6B)

Location	Sub-yearling Chinook				Yearling Chinook				Steelhead				Coho				Sockeye			
	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot
Level 1	1			1																
Level 2	1		5	6							1	1								
Level 3	5	4	4	13																
Level 4	16	13	15	44					1			1								
Level 5	15	16	15	46			1	1												
Level 6	15	11	7	33			1	1												
Level 7	2	3		5																
Net total	55	47	46	148			2	2	1		1	2								
Gatewell				43								6								
Total				191				2				8								
FGE				22.5				0.0				75.0								

13 July (7B)

Location	Sub-yearling Chinook				Yearling Chinook				Steelhead				Coho				Sockeye			
	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot
Level 1		1		3																
Level 2		15		45																
Level 3		23		69						1		3								
Level 4		25		75		2		6		1		3								
Level 5		20		60																
Level 6		6		18																
Level 7																				
Net total		90		270		2		6		2		6								
Gatewell				31				1				12								
Total				301				7				18								
FGE				10.3				14.3				66.7								

Appendix Table 1.--Continued.

14 July (6B)

Location	Sub-yearling Chinook				Yearling Chinook				Steelhead				Coho				Sockeye			
	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot
Level 1		2	2	4																
Level 2	6	18	26	50																
Level 3	7	12	12	31																
Level 4	17	16	27	60																
Level 5	37	34	34	105		1		1												
Level 6	5	7	10	22																
Level 7																				
Net total	72	89	111	272				1												
Gatewell				452								2								
Total				724				1				2								
FGE				62.4				0.0				100								

14 July (7B)

Location	Sub-yearling Chinook				Yearling Chinook				Steelhead				Coho				Sockeye			
	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot
Level 1		1		3																
Level 2		23		69																
Level 3		47		141																
Level 4		38		114																
Level 5		7		21																
Level 6																				
Level 7		1		3																
Net total		117		351																
Gatewell				220								2								
Total				571								2								
FGE				38.5								100								

Appendix Table 1.--Continued.

15 July (6B)

Location	Sub-yearling Chinook				Yearling Chinook				Steelhead				Coho				Sockeye			
	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot
Level 1	5	2	3	10																
Level 2	11	6	18	35																
Level 3	3	5	7	15																
Level 4	5	11	10	26																
Level 5	8	10	21	39		1		1												
Level 6	5	7	7	19																
Level 7			1	1																
Net total	37	41	67	145		1		1												
Gatewell				276				1				2								
Total				421				2				2								
FGE				65.6				50.0				100								

15 July (7B)

Location	Sub-yearling Chinook				Yearling Chinook				Steelhead				Coho				Sockeye			
	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot
Level 1	1	2		3																
Level 2	22	22	16	60																
Level 3	43	65	46	154																
Level 4	75	51	53	179	1	1	1	3												
Level 5	27	24	33	84																
Level 6	19	25	19	63																
Level 7	19	10	9	38																
Net total	206	199	176	581				3												
Gatewell				271				1												
Total				852				4												
FGE				31.8				25.0												

Appendix Table 1.--Continued.

16 July (6B)

Location	Sub-yearling Chinook				Yearling Chinook				Steelhead				Coho				Sockeye			
	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot
Level 1	1	1	2	4																
Level 2	5	3	17	25																
Level 3	16	7	7	30	1			1												
Level 4	28	26	26	80																
Level 5	23	37	31	91																
Level 6	12	7	19	38			1	1												
Level 7		1		1																
Net total	85	82	102	269	1		1	2												
Gatewell				274				1												
Total				543				3												
FGE				50.5				33.3												

16 July (7B)

Location	Sub-yearling Chinook				Yearling Chinook				Steelhead				Coho				Sockeye			
	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot
Level 1																				
Level 2		8		24																
Level 3		34		102																
Level 4		29		87																
Level 5		10		30																
Level 6		2		6																
Level 7		3		9																
Net total		86		258																
Gatewell				93								1								
Total				351								1								
FGE				26.5								100								

Appendix Table 1.--Continued.

17 July (5B)

Location	Sub-yearling Chinook				Yearling Chinook				Steelhead				Coho				Sockeye			
	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot
Level 1		1	1	2																
Level 2	30	4	18	52																
Level 3	11	4	10	25																
Level 4	23	15	13	51																
Level 5	23	25	41	89																
Level 6	16	16	31	63																
Level 7	1		3	4																
Net total	104	65	117	286																
Gatewell				411				3				7								
Total				697				3				7								
FGE				59.0				100				100								

17 July (6B)

Location	Sub-yearling Chinook				Yearling Chinook				Steelhead				Coho				Sockeye			
	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot
Level 1			1	1																
Level 2	3	1	6	10																
Level 3	11	5	14	30																
Level 4	22	28	14	64																
Level 5	17	21	24	62	1			1												
Level 6	4	5	12	21		1		1												
Level 7			1	1																
Net total	57	60	72	189	1	1		2												
Gatewell				386				2				2								
Total				575				4				2								
FGE				67.1				50.0				100								

17 July (7B)

Location	Sub-yearling Chinook				Yearling Chinook				Steelhead				Coho				Sockeye			
	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot
Level 1		1		3																
Level 2		9		27																
Level 3		19		57																
Level 4		19		57		1		3												
Level 5		8		24																
Level 6		1		3																
Level 7		4		12																
Net total		61		183		1		3												
Gatewell				75								1								
Total				258				3				1								
FGE				29.1				0.0				100								

Appendix Table 1.--Continued.

18 July (5B)

Location	Sub-yearling Chinook				Yearling Chinook				Steelhead				Coho				Sockeye			
	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot
Level 1																				
Level 2	4	2	16	22																
Level 3	9	9	5	23																
Level 4	17	8	14	39																
Level 5	28	26	27	81																
Level 6	13	14	10	37																
Level 7	2	2	1	5																
Net total	73	61	73	207																
Gatewell				143																
Total				350																
FGE				40.9																

18 July (6B)

Location	Sub-yearling Chinook				Yearling Chinook				Steelhead				Coho				Sockeye			
	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot
Level 1	1			1																
Level 2	5	1	6	12																
Level 3	10	7	11	28	1			1			1	1								
Level 4	25	21	21	67	1	1		2												
Level 5	29	18	24	71																
Level 6	9	10	14	33																
Level 7		1	2	3																
Net total	79	58	78	215	2	1		3			1	1								
Gatewell				244																
Total				459				3				1								
FGE				53.2				0.0				0.0								

18 July (7B)

Location	Sub-yearling Chinook				Yearling Chinook				Steelhead				Coho				Sockeye			
	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot
Level 1																				
Level 2		41		123																
Level 3		10		30																
Level 4		27		81																
Level 5		10		30																
Level 6																				
Level 7																				
Net total		88		264																
Gatewell				83																
Total				347																
FGE				23.9																

Appendix Table 1.--Continued.

20 July (5B)

Location	Sub-yearling Chinook				Yearling Chinook				Steelhead				Coho				Sockeye			
	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot
Level 1		2	1	3																
Level 2	9	3	10	22																
Level 3	6	10	16	32																
Level 4	25	22	24	71															1	1
Level 5	34	37	24	95	2			2												
Level 6	17	25	24	66	1			1												
Level 7	1	3	3	7																
Net total	92	102	102	296	3			3											1	1
Gatewell				207				7				22				1				
Total				503				10				22				1				1
FGE				41.2				70.0				100				100				100

20 July (6B)

Location	Sub-yearling Chinook				Yearling Chinook				Steelhead				Coho				Sockeye			
	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot
Level 1																				
Level 2	2	2	2	6																
Level 3	1	5	3	9																
Level 4	9	7	8	24																
Level 5	5	8	13	26			1	1												
Level 6	4	1	7	12																
Level 7	2		1	3																
Net total	23	23	34	80				1												
Gatewell				81				2				6								
Total				161				3				6								
FGE				50.3				66.7				100								

20 July (7B)

Location	Sub-yearling Chinook				Yearling Chinook				Steelhead				Coho				Sockeye			
	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot
Level 1																				
Level 2		8		24																
Level 3		12		36																
Level 4		15		45																
Level 5		12		36																
Level 6		1		3		1		3												
Level 7		1		3																
Net total		49		147		1		3												
Gatewell				39				1				3								
Total				186				4				3								
FGE				21.0				25.0				100								

Appendix Table 1.--Continued.

21 July (5B)

Location	Sub-yearling Chinook				Yearling Chinook				Steelhead				Coho				Sockeye			
	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot
Level 1		1	1	2																
Level 2	7	6	11	24																
Level 3	14	15	23	52																
Level 4	30	45	40	115																
Level 5	40	28	46	114	1			1												
Level 6	33	20	27	80		1		1			1	1								
Level 7	1	6	3	10																
Net total	125	121	151	397	1	1		2			1	1								
Gatewell				214				2				5				1				
Total				611				4				6				1				
FGE				35.0				50.0				83.3				100				

21 July (6B)

Location	Sub-yearling Chinook				Yearling Chinook				Steelhead				Coho				Sockeye			
	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot
Level 1																				
Level 2	8	1	10	19																
Level 3	14	19	19	52																
Level 4	37	43	45	125	1		1	2												
Level 5	53	49	61	163	1	2		3												
Level 6	29	25	21	75																
Level 7	2	2	2	6																
Net total	143	139	158	440	2	2	1	5												
Gatewell				187				1				6								
Total				627				6				6								
FGE				27.8				16.7				100								

21 July (7B)

Location	Sub-yearling Chinook				Yearling Chinook				Steelhead				Coho				Sockeye			
	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot
Level 1																				
Level 2		16		48																
Level 3		17		51		1		3												
Level 4		32		96																
Level 5		20		60																
Level 6		2		6																
Level 7		2		6																
Net total		89		267		1		3												
Gatewell				84								2								
Total				351				3				2								
FGE				23.9				0.0				100								

Appendix Table 1.--Continued.

22 July (5B)

Location	Sub-yearling Chinook				Yearling Chinook				Steelhead				Coho				Sockeye			
	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot
Level 1			2	2																
Level 2	11	7	11	29																
Level 3	12	7	23	42																
Level 4	18	25	30	73																
Level 5	31	29	47	107																
Level 6	14	22	20	56																
Level 7		4	2	6																
Net total	86	94	135	315																
Gatewell				344				3				1								
Total				659				3				1								
FGE				52.2				100				100								

22 July (6B)

Location	Sub-yearling Chinook				Yearling Chinook				Steelhead				Coho				Sockeye			
	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot
Level 1			1	1																
Level 2	6	3	5	14																
Level 3	4	6	10	20																
Level 4	16	14	17	47																
Level 5	23	14	22	59																
Level 6	8	3	13	24																
Level 7		2	1	3																
Net total	57	42	69	168																
Gatewell				250																
Total				418																
FGE				59.8																

22 July (7B)

Location	Sub-yearling Chinook				Yearling Chinook				Steelhead				Coho				Sockeye			
	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot
Level 1		1		3																
Level 2		12		36																
Level 3		18		54																
Level 4		11		33		1		3												
Level 5		7		21																
Level 6																				
Level 7																				
Net total		49		147		1		3												
Gatewell				64																
Total				211				3												
FGE				30.3				0.0												

Appendix Table 1.--Continued.

23 July (5B)

Location	Sub-yearling Chinook				Yearling Chinook				Steelhead				Coho				Sockeye			
	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot
Level 1			1	1																
Level 2	8	2	3	13																
Level 3	1	5	4	10		1		1	1			1								
Level 4	13	12	9	34	1	1		2												
Level 5	9	21	20	50	1			1												
Level 6	9	10	13	32																
Level 7		1	2	3																
Net total	86	94	135	143				4				1								
Gatewell				145				2				12								
Total				288				6				13								
FGE				50.4				33.3				92.3								

23 July (6B)

Location	Sub-yearling Chinook				Yearling Chinook				Steelhead				Coho				Sockeye			
	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot
Level 1																				
Level 2	1	1	4	6																
Level 3	3	6	5	14		1		1												
Level 4	13	19	12	44	2	1		3												
Level 5	10	15	22	47																
Level 6	6	4	6	16		1		1												
Level 7	4			4																
Net total	37	45	49	131	2	3		5												
Gatewell				99				8												
Total				230				13												
FGE				43.0				61.5												

23 July (7B)

Location	Sub-yearling Chinook				Yearling Chinook				Steelhead				Coho				Sockeye			
	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot
Level 1																				
Level 2		5		15																
Level 3		11		33																
Level 4		16		48																
Level 5		8		24																
Level 6		2		6																
Level 7																				
Net total		42		126																
Gatewell				62				4				3								
Total				188				4				3								
FGE				33.0				100				100								

Appendix Table 1.--Continued.

24 July (5B)

Location	Sub-yearling Chinook				Yearling Chinook				Steelhead				Coho				Sockeye			
	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot
Level 1		4		4																
Level 2	4		1	5																
Level 3	6	7	11	24																
Level 4	9	17	6	32																
Level 5	21	24	18	63					1			1								
Level 6	17	15	33	65	1		1	2												
Level 7	1	1	1	3																
Net total	58	68	70	196				2				1								
Gatewell				164				6				5								
Total				360				8				6								
FGE				45.6				75.0				83.3								

24 July (6B)

Location	Sub-yearling Chinook				Yearling Chinook				Steelhead				Coho				Sockeye			
	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot
Level 1			1	1																
Level 2	6	2	3	11																
Level 3	7	5	8	20																
Level 4	27	17	21	65																
Level 5	26	24	22	72						2		2					1			1
Level 6	2	6	12	20																
Level 7	6	1		7																
Net total	74	55	67	196						2		2					1			1
Gatewell				187				3				4								
Total				383				3				6								1
FGE				48.8				100				66.7								0.0

24 July (7B)

Location	Sub-yearling Chinook				Yearling Chinook				Steelhead				Coho				Sockeye			
	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot	L	M	R	Tot
Level 1																				
Level 2		7		21																
Level 3		16		48																
Level 4		24		72																
Level 5		13		39																
Level 6		2		6																
Level 7																				
Net total		62		186																
Gatewell				89								2								1
Total				275								2								1
FGE				32.4								100								100

Appendix Table 2.--Descaling data from fish guidance efficiency and descaling tests at McNary Dam, 1992.

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	%
May 11				33	199	16.6	7	56	12.5	4	14	28.6	12	28	42.9
May 11				16	92	17.4	4	36	11.1	1	13	7.7	4	13	30.8
May 13				13	70	18.6	2	34	5.9	1	5	20.0	12	25	48.0
May 13				25	143	17.5	11	130	8.5		3	0.0	11	27	40.7
May 14				16	143	11.2	7	123	5.7				14	36	38.9
May 14				9	72	12.5	2	45	4.4		2	0.0	2	13	15.4
May 18		4	0.0	15	137	10.9	8	56	14.3	1	14	7.1	2	6	33.3
May 19	1	4	25.0	24	234	10.3	4	49	8.2	1	15	6.7	3	8	37.5
May 20		2	0.0	41	209	19.6	4	72	5.6	4	34	11.8	11	17	64.7
May 21		1	0.0	21	139	15.1	6	57	10.5	7	31	22.6	4	15	26.7
May 26		2	0.0	21	98	21.4	3	20	15.0	4	41	9.8	2	5	40.0
May 27	2	7	28.6	25	119	21.0	3	45	6.7	4	41	9.8	2	3	66.7
May 28	4	10	40.0	17	64	26.6	5	38	13.2	8	46	17.4	1	2	50.0
May 29		1	0.0	13	80	16.2	7	34	20.6	13	43	30.2		1	0.0

Unit 5, Slot B

Test date	Subyearling chinook			Yearling chinook			Steelhead			Coho			Sockeye		
	Desc.	Catch	%	Desc.	Catch	%	Desc.	Catch	%	Desc.	Catch	%	Desc.	Catch	%
27 April		6	0.0	69	227	30.4	2	14	14.3	1	8	12.5	12	42	28.6
28 April				56	204	27.4	2	8	25.0		6	0.0	11	52	21.2
29 April	1	4	25.0	19	137	13.9	6	38	15.8		13	0.0	30	108	27.8
30 April		5	0.0	92	263	35.0	7	46	45.2	4	25	16.0	61	161	37.9
4 May		5	0.0	87	487	17.9	6	109	5.5	4	94	4.3	101	444	22.7
5 May		5	0.0	126	646	19.5	1	24	4.2	2	26	7.7	73	153	47.7
6 May		2	0.0	80	664	12.0	4	44	9.1	1	10	10.0	31	66	47.0
7 May				76	396	19.2	7	47	14.9	1	4	25.0	26	72	36.1
8 May				106	457	23.2	5	54	9.3	2	18	11.1	42	81	51.9

[a] Number of descaled fish captured in gatewell.

[b] Total gatewell catch.

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

Appendix Table 2.--Continued.

Unit 5, Slot B

Test date	Subyearling chinook			Yearling chinook			Steelhead			Coho			Sockeye		
	Desc.	Catch	%	Desc.	Catch	%	Desc.	Catch	%	Desc.	Catch	%	Desc.	Catch	%
11 May		1	0.0	55	299	18.4	6	76	7.6	8	23	34.8	11	24	45.8
11 May				17	78	21.8	3	25	12.0	4	12	33.3	7	16	43.8
13 May		1	0.0	30	227	13.2	7	229	3.1		12	0.0	11	27	40.7
13 May	1	2	50.0	10	44	22.7		25	0.0		2	0.0	1	8	12.5
14 May	2	3	66.7	20	127	15.7	10	136	7.4				3	13	23.1
14 May				12	72	16.7	2	35	5.7				5	15	33.3
15 May		1	0.0	68	312	21.8	2	47	4.3		3	0.0	2	13	15.4
15 May				30	265	11.3	1	43	2.3	1	3	33.3	11	39	28.2
18 May	2	4	50.0	18	169	10.7	5	53	9.4	5	53	9.4	1	11	9.1
19 May		2	0.0	27	175	15.4	3	46	6.5		18	0.0	4	14	28.6
20 May		2	0.0	60	308	19.5	7	47	14.9	6	34	17.6	15	33	45.5
21 May		6	0.0	27	231	11.7	9	68	13.2	3	35	8.6	6	25	24.0
26 May	1	3	33.3	34	118	28.8	5	21	23.8	5	49	10.2	5	10	50.0
27 May		6	0.0	35	162	21.6	11	62	17.7	6	47	12.8	3	6	50.0
28 May	1	5	20.0	27	99	27.3	2	26	7.7	7	40	17.5	3	9	50.0
29 May	1	5	20.0	24	115	20.9	9	41	22.0	13	83	15.7	1	4	25.0
22 June	275	1484	18.5		8	0.0		2	0.0					1	0.0
23 June	46	411	11.2	1	3	33.3	1	2	50.0						
24 June	36	548	6.6		2	0.0		2	0.0						
25 June	26	298	8.9	1	2	50.0		1	0.0						
26 June	197	2760	7.1		6	0.0		1	0.0						
27 June	47	958	4.9		4	0.0								1	0.0
28 June	9	432	2.1		4	0.0		1	0.0				1	1	100.0
29 June	22	481	4.6		1	0.0	1	2	50.0						
7 July	30	157	19.1				1	6	16.7						
8 July	12	85	14.1	1	2	50.0	1	2	50.0						
9 July	38	142	26.8		2	0.0		1	0.0						
10 July	13	202	6.4		6	0.0	2	25	8.0						
11 July	44	377	11.7	3	5	60.0		12	0.0						
13 July	2	35	5.7		1	0.0									
14 July	10	81	12.3				1	1	100.0						
15 July	42	350	12.0					1	0.0						
16 July	27	197	13.7		4	0.0		2	0.0						
17 July	29	411	7.1		13	0.0		7	0.0						
18 July	8	143	5.3												
20 July	27	207	13.0	1	7	14.3		22	0.0		1	0.0			
21 July	26	214	12.1		2	0.0		5	0.0		1	0.0			
22 July	22	344	6.4		3	0.0		1	0.0						
23 July	27	145	18.6		2	0.0	4	12	33.3						
24 July	20	164	12.2		6	0.0	1	5	20.0						

Appendix Table 2.--Continued.

Unit 5, Slot C

Test date	Subyearling chinook			Yearling chinook			Steelhead			Coho			Sockeye		
	Desc.	Catch	%	Desc.	Catch	%	Desc.	Catch	%	Desc.	Catch	%	Desc.	Catch	%
18 May				11	124	8.9	3	20	15.0	2	9	22.2	4	8	50.0
19 May		2	0.0	23	167	13.8	3	33	33.3	2	10	20.0	1	8	12.5
20 May		2	0.0	16	177	9.0	4	43	9.3	3	23	13.0	14	30	46.7
21 May		4	0.0	22	180	12.2	7	40	17.5	2	25	8.0	7	17	41.2
26 May				16	65	24.6	1	8	12.5	5	6	31.2		4	0.0
27 May	2	6	33.3	16	76	21.1	2	32	6.2	3	30	10.0	1	4	25.0
28 May		4	0.0	11	52	21.2	3	20	15.0	2	18	11.1	2	4	50.0
29 May		2	0.0	12	35	34.3		8	0.0	4	20	20.0	5	6	83.3

Unit 6, Slot A

Test date	Subyearling chinook			Yearling chinook			Steelhead			Coho			Sockeye		
	Desc.	Catch	%	Desc.	Catch	%	Desc.	Catch	%	Desc.	Catch	%	Desc.	Catch	%
15 May		2	0.0	17	159	8.9	4	45	8.9	2	7	28.6	2	9	22.2
15 May		2	0.0	11	61	18.0	6	34	17.6		3	0.0	3	4	75.0
18 May				15	135	11.1	2	26	7.7		14	0.0	3	5	60.0
19 May				19	265	7.2	7	44	15.9	1	16	6.2	1	10	10.0
20 May		3	0.0	23	206	11.2	3	55	5.5	3	44	6.8	2	30	6.7
21 May		6	0.0	15	235	6.4	8	53	15.1	5	44	11.4	7	24	29.2
26 May				7	46	15.2	1	6	16.7	2	23	13.0	1	1	100.0
27 May	3	21	14.3	30	173	17.3	6	85	7.1	7	66	10.6	4	10	40.0
28 May	2	5	40.0	16	111	14.4	6	48	12.5	10	54	18.5	2	3	66.7
29 May		2	0.0	21	90	23.3	8	56	14.3	3	42	7.1	4	5	80.0

Appendix Table 2.--Continued.

Unit 6, Slot B

Test date	Subyearling chinook			Yearling chinook			Steelhead			Coho			Sockeye		
	Desc.	Catch	%	Desc.	Catch	%	Desc.	Catch	%	Desc.	Catch	%	Desc.	Catch	%
27 April				23	96	24.0	1	6	16.7		1	0.0	2	6	33.3
28 April		3	0.0	84	369	22.8	6	32	18.8		9	0.0	15	83	18.1
29 April		2	0.0	16	64	25.0	2	18	11.1	2	4	50.0	11	47	23.4
30 April				34	171	19.9	2	31	6.5	2	16	12.5	48	160	30.0
4 May				11	80	13.8	3	28	10.7		18	0.0	17	44	38.6
5 May		1	0.0	37	202	18.3		13	0.0	3	31	9.7	24	76	31.6
6 May		2	0.0	42	383	11.0	1	27	3.7	2	22	9.1	17	69	24.6
7 May		1	0.0	31	248	12.5	1	18	5.6		2	0.0	8	42	19.0
8 May		1	0.0	62	453	13.7	5	72	6.9	6	21	28.6	45	119	37.8
11 May				65	348	18.7	9	132	6.8	3	46	6.5	24	41	58.5
11 May				30	90	33.3	10	50	20.0	2	11	18.2	11	31	35.5
14 May				22	159	13.8	6	103	5.8	1	3	33.3	12	33	36.4
14 May				6	45	13.3	1	35	2.9		1	0.0	6	11	54.5
15 May		1	0.0	34	215	15.8	2	48	4.2		2	0.0	2	6	33.3
15 May	1	1	100.0	13	239	13.0	4	42	9.5	2	6	33.3	11	34	32.4
18 May	1	3	33.3	15	125	12.0	2	20	10.0		4	0.0	4	11	36.4
19 MAY	1	2	50.0	25	245	10.2	5	53	9.4		16	0.0	5	14	35.7
20 May	1	2	50.0	23	218	10.6	4	44	9.1	2	32	6.2	5	19	26.3
21 May		4	0.0	19	279	6.8	5	58	8.6	5	43	11.6	11	21	52.4
26 May	1	2	50.0	9	69	13.0	4	15	36.7	3	18	16.7	6	8	75.0
27 May	2	14	14.3	24	153	15.7	10	64	15.6	5	38	13.2	1	2	50.0
28 May		6	0.0	8	54	14.8	5	34	14.7	6	48	12.5	2	4	50.0
29 May		4	0.0	14	69	20.3	1	30	3.3	3	35	8.6	5	9	55.6
22 June	11	535	2.1					2	0.0					1	0.0
23 June	18	304	5.9		2	0.0								1	0.0
24 June	29	239	12.1		1	0.0		1	0.0		1	0.0			
25 June	5	140	3.6												
26 June	31	1106	2.8											2	0.0
27 June	6	332	1.8												
28 June	7	348	2.0		2	0.0	1	2	50.0						
29 June	24	408	5.9												
6 July	2	82	2.4					2	0.0						
7 July	5	144	3.5		2	0.0	1	6	16.7						
8 July	18	117	15.4					6	0.0						
9 July	20	288	6.9		2	0.0		3	0.0						
10 July	63	226	27.9	3	16	18.8	5	52	9.6						
11 July	18	360	5.0	1	7	14.2		17	0.0						
13 July		43	0.0					6	0.0						
14 July	16	452	3.5				1	2	50.0						
15 July	7	276	2.5		1	0.0		2	0.0						

Appendix Table 2.--Continued.

Unit 6, Slot B

Test date	Subyearling chinook			Yearling chinook			Steelhead			Coho			Sockeye		
	Desc.	Catch	%	Desc.	Catch	%	Desc.	Catch	%	Desc.	Catch	%	Desc.	Catch	%
16 July	19	274	6.9		1	0.0									
17 July	17	386	4.4		2	0.0		2	0.0						
18 July	9	244	3.7												
20 July	7	81	8.6		2	0.0		6	0.0						
21 July	26	187	13.9		1	0.0	2	6	33.3						
22 July	7	250	2.8												
23 July	23	99	23.2	2	8	25.0		6	0.0						
24 July	29	187	15.5	1	3	33.3		4	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	%
28 April		5	0.0	13	152	8.6	1	15	6.7		5	0.0	1	38	2.6
30 April				7	73	9.6		13	0.0		2	0.0	7	48	14.6
4 May		2	0.0	22	163	13.5		10	0.0		5	0.0		6	0.0
5 May		2	0.0	7	90	7.8	1	6	16.7	1	22	4.5	7	51	13.7
6 May		2	0.0	17	298	5.7		9	0.0		10	0.0	12	62	19.4
7 May				11	159	6.9		14	0.0		20	0.0	3	16	18.8
8 May				52	368	14.1	8	57	14.0		4	0.0	18	43	41.9
11 May		1	0.0	30	282	10.6	7	106	6.6	1	31	3.2	8	35	22.9
11 May				4	74	5.4	5	43	11.6		8	0.0	1	2	8.3
13 May		3	0.0	4	125	3.2	2	48	4.2		4	0.0	5	27	18.5
13 May		1	0.0	17	178	9.6	19	187	10.2		1	0.0	10	17	58.8
14 May		3	0.0	13	210	6.2	4	88	4.5		2	0.0	5	138	13.2
14 May				7	59	11.9	1	22	4.5				4	12	33.3
18 May				28	217	12.9	2	32	6.2	1	15	6.7	6	14	42.9
19 May		5	0.0	32	299	10.7	5	36	13.9	1	8	12.5	1	4	25.0
20 May		4	0.0	64	614	10.4	17	149	11.4	6	76	7.9	7	26	26.9
21 May		5	0.0	9	277	3.2	4	59	6.8	1	43	2.3	1	13	7.7
26 May	1	1	100.0	4	36	11.1	2	9	22.2	2	11	18.2		1	0.0
27 May		11	0.0	29	154	18.8	9	59	15.3	2	78	2.6	4	7	57.1
28 May		7	0.0	4	32	12.5	3	25	12.0	8	45	17.8		3	0.0
29 May	2	9	22.2	11	86	12.8	9	56	16.1	8	41	19.5	4	6	66.7
22 June	46	403	11.4		15	0.0	2	12	16.7						
23 June	43	414	10.4												

Appendix Table 2.--Continued.

Unit 7, Slot B

Test date	Subyearling chinook			Yearling chinook			Steelhead			Coho			Sockeye		
	Desc.	Catch	%	Desc.	Catch	%	Desc.	Catch	%	Desc.	Catch	%	Desc.	Catch	%
24 June	12	181	6.6											1	0.0
25 June	22	367	6.0		3	0.0									
26 June	17	869	2.0		1	0.0									
27 June	19	911	2.1		1	0.0								1	0.0
28 June	3	49	6.1												
29 June	11	203	5.4					2	0.0						
6 July															
7 July	4	93	4.3		4	0.0	1	9	11.1						
8 July	3	47	6.4		1	0.0									
9 July	10	95	5.1	1	2	50.0		7	0.0						
10 July	4	195	2.1	1	3	33.3	9	32	28.1						
11 July	7	267	2.6	4	7	57.1		8	0.0						
13 July	2	31	6.5		1	0.0	2	12	16.7						
14 July	2	220	0.9				2	2	100.0						
15 July	9	271	3.3		1	0.0									
16 July	2	93	2.2					1	0.0						
17 July	2	75	2.7					1	0.0						
18 July	2	83	2.4												
20 July		39	0.0		1	0.0		3	0.0						
21 July	1	84	1.2				2	2	100.0						
22 July	2	64	3.1												
23 July	1	62	1.6		4	0.0	2	3	66.7						
24 July	2	89	2.2				2	2	100.0						

Appendix Table 3.--Descaling test analyses and conditions for yearling chinook salmon at McNary Dam, 1992. Asterisks indicate statistically significant differences between test conditions.

Test dates	Analysis type	Calculated test statistic	df	p	Unit slot, guidance device	Operating gate position	Perforated plate porosity (%)	Guidance device elevation	Flow (kcfs)
27 - 30 April	Two t[a]	t=2.02	7	0.0831	5B, ESBS[b]	NOG[c]	33	Std[d]	16
4 - 8 May					5B, ESBS	NOG	33	Low 60 cm[e]	16
27 - 30 April	RBANOV[f]	F=3.11	2,5	0.1324	5B, ESBS	NOG	33	Low 60 cm/Std	16
4 - 5 May					6B, ESBS	NOG	30	Low 60 cm/Std	16
					7B, STS[g]	NOG	48	Std	16
6 - 8 May	RBANOV	F=10.12*	2,4	0.0273	5B, ESBS	PROG[h]	33	Low 60 cm/Std	16
					6B, ESBS	PROG	30	Low 60 cm/Std	16
					7B, STS	NOG	48	Std	16
27 - 30 April	RBANOV	F=7.14*	2,11	0.0104	5B, ESBS	NOG/PROG	33	Low 60 cm/Std	16
4 - 8 May					6B, ESBS	NOG/PROG	30	Low 60 cm/Std	16
					7B, STS	NOG	48	Std	16
11 - 15 May	2-ANOV[i] unit	F= 3.18*	3,20	0.0464	5A, ESTS[j]	SOG[k]	25	Std	16/12
	2-ANOV flow	F= 0.63	1,20	0.4445	5B, ESBS	SOG	26	Std	16/12
	2-ANOV unit vs flow	F= 0.10	3,20	0.9569	5C, ESTS	SOG	34	Std	16/12
					7B, STS	NOG	48	Std	16/12
18 - 21 May	RBANOV	F= 2.12*	5,15	0.1189	5A, ESTS	SOG	25	Std	16
					5B, ESBS	PROG	26	Std	16
					5C, ESTS	NOG	34	Std	16
					6A, ESBS	NOG	30	Std	16
					6B, ESBS	PROG	30	Std	16
					7B, STS	NOG	48	Std	16
26 - 29 May	RBANOV	F= 4.30	5,15	0.0126	5A, ESTS	SOG	25	Std	16
					5B, ESBS	NOG	26	Std	16
					5C, ESTS	NOG	34	Std	16
					6A, ESBS	SOG	30	Std	16
					6B, ESBS	PROG	30	Std	16
					7B, STS	NOG	48	Std	16
18 - 29 May	RBANOV	F= 4.14	3,21	0.0187	5A, ESTS	SOG	25	Std	16
					5C, ESTS	NOG	34	Std	16
					6B, ESBS	PROG	30	Std	16
					7B, STS	NOG	48	Std	16
6 - 8 May	Paired t[l]	t= 1.96	10	0.0777	6B, ESBS	PROG	30	Std	16
18 - 21 May					7B, STS	NOG	48	Std	16
26 - 29 May									

[a] Two-sample t-test.
[b] Extended-length submersible bar screen.
[c] No operating gate (fully raised or removed).
[d] Standard screen elevation.
[e] Screen lowered 60 cm below standard elevation.
[f] Randomized block analysis of variance.
[g] Standard-length submersible traveling screen.
[h] Partially raised operating gate (raised 2.4 m).
[i] Two factor analysis of variance.
[j] Extended-length submersible traveling screen.
[k] Stored operating gate (standard position).
[l] Paired sample t-test.

Appendix Table 4.--Gill Na^+-K^+ ATPase (μmol P_i · mg $Prot^{-1}$ · h^{-1}) data for yearling and subyearling chinook salmon from FGE tests at McNary Dam, 1992 (---- indicates samples collected were lost due to storage problems).

Species	Date	Statistic	Gatewell	All nets combined
Yearling chinook	29 Apr	x	35.8	34.8
		SD	10.2	8.8
		n	20	20
	30 Apr	x	31.9	28.5
		SD	7.9	8.5
		n	20	20
	18 May	x	----	29.0
		SD	----	8.4
		n	0	20
	19 May	x	34.0	31.1
		SD	7.5	11.6
		n	20	20
	28 May	x	31.7	30.4
		SD	10.1	9.4
		n	20	20
	29 May	x	27.9	33.9
		SD	10.0	8.3
		n	19	20
Subyearling chinook	25 June	x	27.4	24.9
		SD	9.6	6.9
		n	18	14
	26 June	x	----	24.7
		SD	----	10.5
		n	0	20