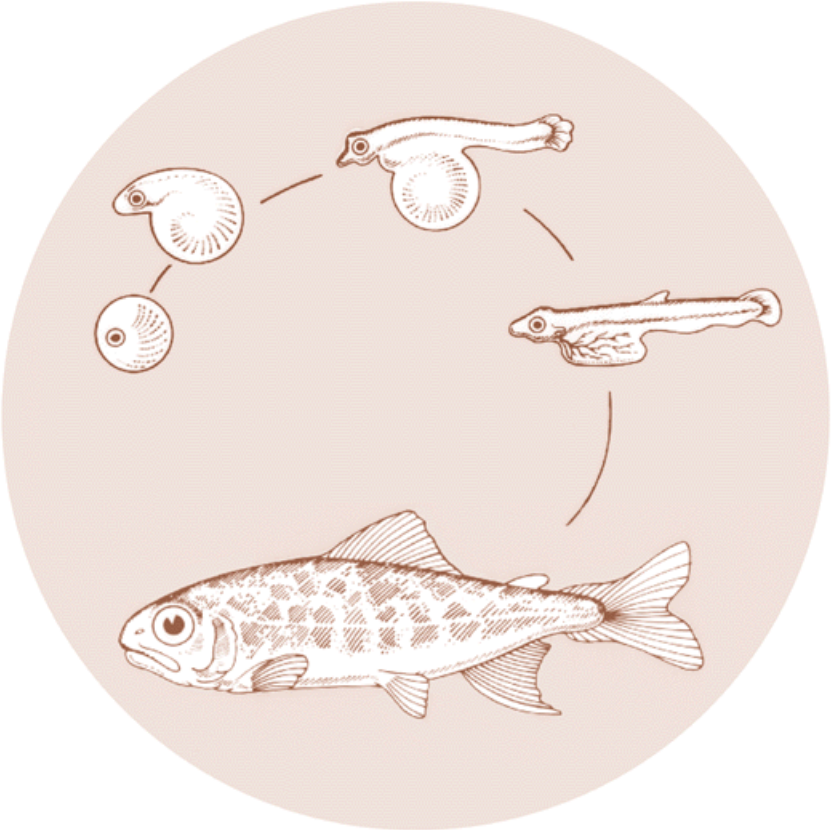
July 1989

AUGMENTED FISH HEALTH MONITORING

Annual Report



DOE/BP-63461-3

This report was funded by the Bonneville Power Administration (BPA), U.S. Department of Energy, as part of BPA's program to protect, mitigate, and enhance fish and wildlife affected by the development and operation of hydroelectric facilities on the Columbia River and its tributaries. The views of this report are the author's and do not necessarily represent the views of BPA.

This document should be cited as follows:

Michak, Patty; B. Rogers, P. Chapman, K. Amos, Washington State Dept. of Fisheries, Augmented Fish health Monitoring, Annual Report to Bonneville Power Administration, Portland, OR, Contract 86-AI63461, 157 electronic pages (BPA Report DOE/BP-63461-3)

This report and other BPA Fish and Wildlife Publications are available on the Internet at:

http://www.efw.bpa.gov/cgi-bin/efw/FW/publications.cgi

For other information on electronic documents or other printed media, contact or write to:

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

Please include title, author, and DOE/BP number in the request.

AUGMENTED FISH HEALTH MONITORING

Annual Report

Prepared by:

Patty Michak
Bob Rogers
Pat Chapman
Kevin Amos

Washington State Department of Fisheries

Prepared for:

U.S. Department of Energy
Bonneville Power Administration
Environment, Fish and Wildlife
PO Box 3621
Portland, Oregon 97208

Contract No. DE-AI79-86BP63461

July 1989

Table of Contents

Introduction 1
Description of Study Area 1
Methods and Materials 1
Database Development 6
Results and Discussion 7
Special Projects 25
Summary and Conclusions 28
Acknowledgments 29
Literature Cited 30
Appendix A. Ovarian Fluid Testing Protocol for Bacterial Kidney Disease. . . . . Al
Appendix B. Mvxobolus cerebralis Sampling and Processing Protocol. . . . . Bl
Appendix C. Disease Prevalence Summary Report..... .Cl
Appendix D. Hatchery Rearing Parameters and Mortality Summary Report..... . . . . .Dl
Appendix E. Yearly Medication Report. . . . . El
Appendix F. Adult Contribution of Index Station Stocks . . Fl
Appendix G. Juvenile Hematocrit and Leucocrit data 1987 & 1988. . . . Gl
Appendix H. Organosomatic Analysis Summary Report and raw data . . . . . Hl

List of Tables

Table 1. Washington Department of Fisheries Columbia Basin Hatcheries. 3
Table 2. Pathogen Detection Methods. 5
Table 3. Inspection Results of Returning Adults 1987 and 1988. 8
Table 4. Erythrocytic Inclusion Body Syndrome prevalence in spawning adult salmon differentiated by species in 1987 & 1988. 7
Table 5. Prevalence of Bacterial Kidney Disease in spawning Adult salmon differentiated by species in 1987 & 1988. . . 10
Table 6. Pre-release Sampling Results - Yearling Age Releases, 1987 & 1988. 16
Table 7. Pre-release Sampling Results - Zero Age Releases, 1987 & 1988. 18
Table 8. Mean hematpcrit and Mean Hematocrit Range by species and release age. 20
Table 9. Midterm Sampling Results, 1987 and 1988 21
Table 10. Organosomatic Analysis - Index Stocks. 20
Table 11. Comparison of observed tissue abnormalities at Cowlitz hatchery, yearling spring chinook releases for 1987 & 1988. 22
Table 12. Comparison of observed tissue abnormalities at Lyons Ferry hatchery, yearling fall chinook releases. . . 23
Table 13. Comparison of observed tissue abnormalities in Cowlitz fall chinook releases in 1987 & 1988. 24
Table 14. Comparison of observed tissue abnormalities between Cowlitz fall chinook normal and delayed lots, by release year. . . . . , ... 25

List of Figures

Figure 1. Washington Department of Fisheries Columbia Basin Hatcheries. 2
Figure 2. Juvenile loss to coldwater Disease at WDF lower Columbia hatcheries, 1987 and 1988. 12
Figure 3. Juvenile loss to Coldwater Disease at WDF upper Columbia hatcheries, 1987 and 1988. 12
Figure 4. Juvenile loss to Bacterial Kidney Disease at WDF lower Columbia hatcheries, 1987 and 1988. . 13
Figure 5. Juveniie loss to Bacterial Kidney Disease at WDF upper Columbia hatcheries, 1987 and 1988. 13
Figure 6. Juvenile loss to Enteric Redmouth at WDF lower Columbia hatcheries, 1987 and 1988. 14
Figure 7. Juvenile loss to Enteric Redmouth at WDF upper Columbia hatcheries, 1987 and 1988. 14
Figure 8. Juvenile loss to Furunculosis at WDF lower Columbia hatcheries, 1987 and 1988. 15

INTRODUCTION

Since 1986 Washington Department of Fisheries (WDF) has participated in the Columbia Basin Augmented Fish Health Monitoring Project, funded by Bonneville Power Administration (BPA). This interagency project was developed to provide a standardized level of fish health information from all Agencies rearing fish in the Columbia Basin. Agencies involved in the project are; WDF, Washington Department of Wildlife, Oregon Fish and Wildlife, Idaho Fish and Game, and the U.S. Fish and Wildlife Service.

WDF has actively participated in this project, and completed its second year of fish health monitoring, data collection and pathogen inspection during 1988. This report will present data collected from January 1, 1988 to December 31, 1988 and will compare sampling results from 1987 and 1988. The analysis will be divided in two sections: adult analysis and juvenile analysis. The adult analysis will include results from screening at spawning for viral pathogens and bacterial kidney disease (BKD), and evaluation of causes of pre-spawning loss. The juvenile analysis will include pre-release examination results, mid-term rearing exam results and evaluation of the Organosomatic Analysis completed on index stocks. Additionally, highlights from monthly monitoring exams completed by staff Fish Pathologists will identify any significant and unusual findings from the routine exams completed in 1988.

A more detailed explanation of the overall project can be found in Michak and Rogers (1989).

DESCRIPTION OF STUDY AREA

WDF operates 9 hatcheries in the Lower Columbia Basin, Columbia River mouth to Snake River confluence, and 5 hatcheries in the Upper Columbia Basin (including the Snake River drainage) Figure 1. Species reared include spring, summer and fall chinook and early (Type S) and late (Type N) coho. Watershed and species reared by hatchery are listed in Table 1.

METHODS AND MATERIALS

Methods used to detect specific pathogens have been agreed upon by technical representatives of all participating agencies. Generally all procedures follow the standards for pathogen detection in Amos (1985). Changes or deviations from 1987 methods will be detailed.

Sampling of adults and juveniles was conducted on site by staff fisheries biologists or fish pathologists or supervised by them. All samples, with the exception of bacteriology culture plates, are received at our main lab located on The Evergreen State College campus, Olympia, Washington. Bacteriology is completed at our lab located in the Salmon Culture Division office, downtown Olympia.

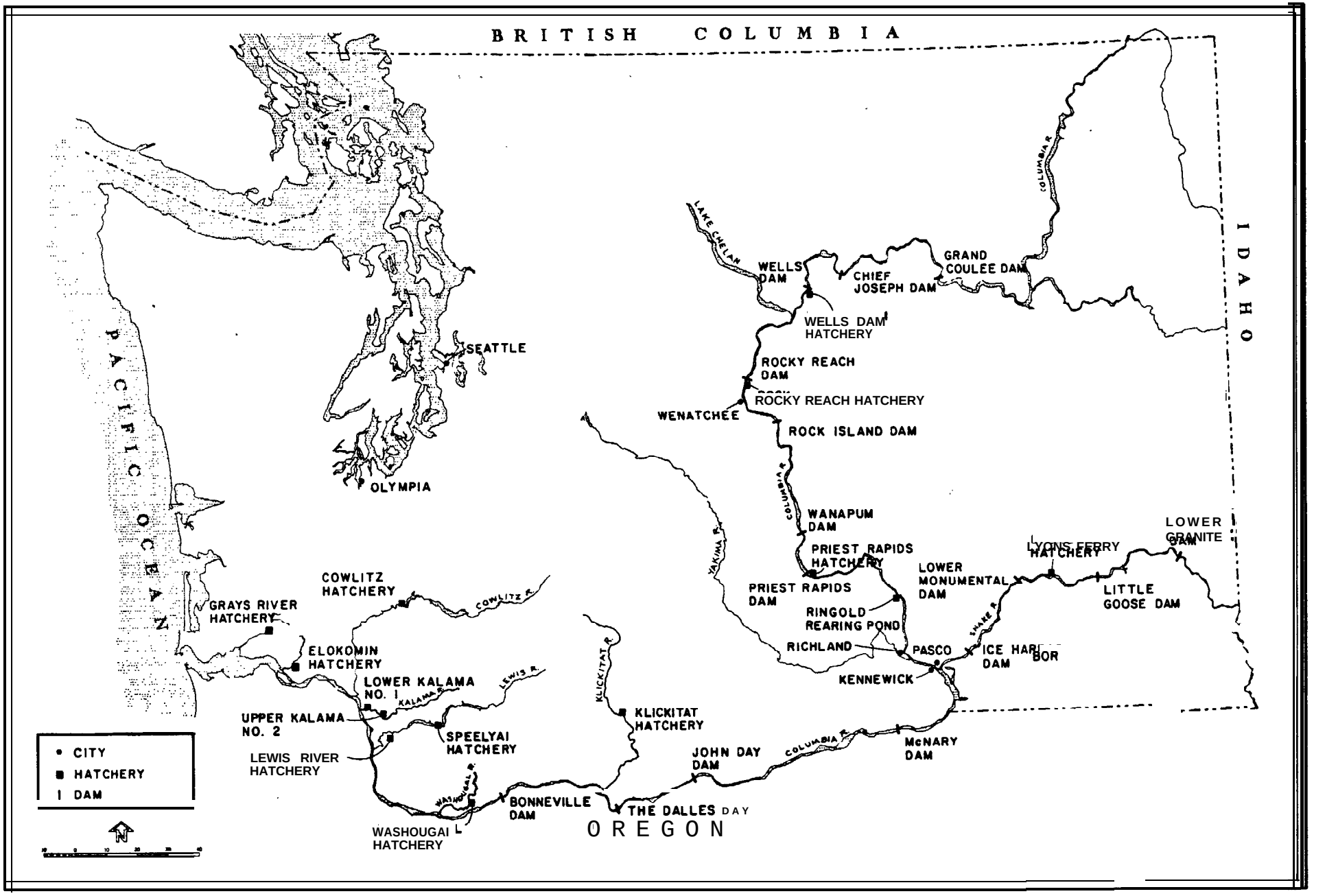


Figure 1. Washington Department of Fisheries Columbia Basin hatcheries.

Table 1. Washington Department of Fisheries Columbia Basin Hatcheries

Hatchery	Watershed	Rearing Program *
LOWER COLUMBIA		
Cowlitz	Cowlitz River	Spring and fall chinook & Late coho
Toutle	Cowlitz River	Early coho and fall chinook (release only)
Elokomin	Elokomin River	Fall chinook and Late coho
Grays River	Grays River	Fall chinook and Early coho
Kalama Falls	Kalama River	Spring and fall chinook & Late coho
Klickitat	Klickitat River	Spring and fall chinook & Late coho
Lewis River	Lewis River	Spring chinook & Early and late coho
Lower Kalama	Kalama River	Fall chinook & Early coho
Speelyai	Lewis River	Spring chinook & Early coho
Washougal	Washougal River	Fall chinook & Early and late coho
UPPER COLUMBIA		
Lyon's Ferry	Snake River	Fall chinook
Tucannon	Tucannon	Spring chinok
Priest Rapids	Columbia River	Fall chinook
Ringold	Columbia River	Fall and spring chinook & Early coho
Rocky Reach	Columbia River	Fall chinook & Early and late coho
Wells	Columbia River	Summer chinook

In June of 1988 technical representatives and lab personnel from all participating agencies met in Olympia, WA. to develop a criteria for positive status in blood films for Crythrocytic Inclusion Body Syndrome (EIBS). After review of 35mm slides and prepared blood films it was agreed that positive samples must contain a minimum of two erythrocytes with a large, 0.8 - 2.0 u, light blue staining (Leishman/Giemsa) cytoplasmic inclusion. If small, dark staining (< 0.6u) multiple inclusions were seen, at least one larger (0.8 - 2.0u) light staining inclusion must be seen for the sample to be positive.

From January 1, 1988 to December 31, 1988, fish health monitoring sampling was conducted on 23 adult stocks at spawning, 20 yearling releases (1986 brood), 14 sub-yearling "zero" age releases (1987 brood) and 18 midterm exams (1987 brood). In addition to sampling, processing, reading and recording all the above, monthly monitoring and diagnostic visits were completed and monthly hatchery rearing data and fish pathologists reports were entered in the database.

Adult Analysis

Fish health monitoring of 1988 returning adults involved virus screening for Infectious Hematopoietic Necrosis Virus (IHNV), Infectious Pancreatic Necrosis Virus (IPNV) and other replicating agents including Viral Hemorrhagic Septicemia. Screening for EIBS and BKD was also completed on returning adults. The above sampling was done at spawning on all species returning to the facilities listed in Table 1.

Adults were also routinely examined during the pre-spawning holding period. Fresh mortalities were examined by the visiting fish pathologist to determine cause(s) of pre-spawning mortality. Special attention was given in looking for Furunculosis, Enteric Rednouth (ERM) and Ceratonyxosis to determine their role in pre-spawning mortality.

Pathogen detection methods were as per Amos (1985) or agreed upon protocol by the Project Steering Committee as outlined in Table 2. The protocol for BKD detection by using ovarian fluid differ from that published in Michak and Rogers (1989) and is presented in Appendix A. During 1988 the virology protocol for IHNV detection was altered by incorporating Polyethylene Glycol (PEG) into the antibiotic incubation mix for the ovarian fluid samples.

Juvenile Analysis

Monthly monitoring visits continued throughout 1988. All stocks and brood years at WDF Columbia Basin hatcheries were evaluated by the visiting fish pathologist to determine their general overall health condition. Routine exams included: externai appearance, eye condition, fin integrity, gill condition, externai and gill parasite prevalence, and internal organ. color and quality. In addition the disease status of moribund fish and a cause for any increase in loss was determined by the appropriate menthod (gram stain, wet mount, bacterial

Table 2. Pathogen Detection Methods

Disease/ Pathogen	Life Stage	Tissue Samnled	Detection Method'
Viral			
IHNV	Juvenile Adult	Kidney/spleen Ovarian fluid	Tissue culture EPC\CHSE 214 Tissue culture EPC w/PEG
IPNV	Juvenile & Adult	Kidney/spleen	Tissue culture CHSE 214
EIBS	Juvenile & Adult	Blood film	Leishman/Giemsa stain, reac two (2) minutes at 1000X
Bacterial			
R. salmoninarum	Juvenile Adult'	Kidney smear Ovarian fluid	FAT, 30 fields at 600X FAT, 30 fields at 600X
C. psychrophila	Juvenile	Kidney or spleen	Gram stain
A. salmonicida	Juvenile & Adult	Kidney or spleen	Culture TSA media
Y. ruckeri	Juvenile & Adult	Kidney or spleen	Culture TSA media
Parasite			
M. cerebralis	Juvenile	Head cartilage	Digest Method confirm by histopathology
C. Shasta	Juvenile & Adult	Hindgut	Light microscopy
PKX	Juvenile	Posterior kidney	Light microscopy, confirm by histopathology

IHNV - Infectious Hematopoietic Necrosis Virus
IPNV - Infectious Pancreatic Necrosis Virus
EIBS - Erythrocytic Inclusion Bcdy Syndrome
PEG - Polyethylene Glycol

[1] Amos, K., 1985. Procedures for the Detection and Identification of Certain Fish Pathogens. American Fisheries Society, Fish Health Section, Bethesda, MD. 119 pages.
[2] For detailed protocol see Appendix A.

culture, tissue culture, etc.) as determined by the pathologist following the agreed upon methods outlined in Table 2.

Pre-release examinations were conducted on 1986 brood yearling and 1987 brood "zero" age release groups at all stations listed in Table 1. Sixty asymptomatic fish were screened for IHNV, IPNV, EIBS, BKD and where appropriate Mvxobolus cerebralis (generally sampled at midterm). In addition to the sixty fish sample, up to 10 moribund fish were sampled for IHNV and IPNV. Tissues sampled and detection techniques are listed in Table 2. Additionally hematocrit data was collected on all release groups. Hematocrits were not required by contract, but we felt valuable baseline information could be collected with a minimum of effort.

Midterm exams were conducted on all yearling groups at approximately 6 months (or greater) into their rearing cycle. Exams included sampling 60 asymptomatic fish for BKD and sampling the most susceptible species, at hatcheries with surface water supplies, for M. cerebralis. Sampling for M. cerebralis at midterm reduced the volume of tissue to be processed by one half or more. In 1988 we changed our detection method for M. cerebralis from the plankton centrifuge method to the digest method. This change was made because of the high noise level and fornalin fumes of the plankton centrifuge method. Since either method was acceptable we opted for the digest method. A detailed protocol for M. cerebralis screening is presented in Appendix B.

Organosomatic analysis based on Goede's method was performed at release on index station stocks. WDF index stations and stocks are: Cowlitz hatchery spring and fall chinook, Lewis River (Speelyai) hatchery early coho (Type-S) and Lyon's Ferry hatchery fall chinook. All stocks are coded wire tagged as part of U.S./Canada management and other projects.

DATABASE DEVELOPMENT

Database development continued throughout 1988 and will continue over the duration of this project as we find new ways to look at and correlate the data. The forms and data entry described in Michak and Rogers (1989) are still being used and have not been modified. Report generation is continuing to evolve and we will produce additional reports in i989, mainly dealing with juvenile disease screening results and pathogen prevalence data. At present the following reports are routinely generated and will present the 1988 data in this report: Disease Prevalence Summary (Appendix C), Hatchery Rearing Parameters and Mortality Summary (Appendix D), and Yearly Medication Report (Appendix E).

Historical Database

An update of **adult** contribution, expressed as % survival, at **Index stations is presented in** Appendix F. Percent survival is based on coded wire tag recoveries from all fisheries and hatchery rack returns. No evaiuation of the project based on adult contribution car. be conducted until more recent broods (1985 and beyond begin to **contribute to the fisheries** and return to hatcheries.-es.

RESULTS AND DISCUSSION

Results of fish health inspections on adults and juveniles were recorded in two ways. For IHNV, IPNV and M. cerebralis results are listed as positive (P) or negative (N). The results are for the species and stock, prevalence is not given because we were determining just the presence or absence of virus or parasite in the population. If IHNV has been found previously or the population is suspect, additional sampling to the 60 fish was conducted (at WDF's expense). For all other pathogens results were listed as the number positive.

For comparison results tables are a summary of adult or juvenile sampling completed in 1987 and 1988. Adults are listed by return year and juveniles are listed by brood year, yearling releases separate from zero releases.

Adult Analysis

Results of inspections on 1987 and 1988 returning adults are shown in Table 3. IHNV was found in 3 stocks in 1988, Cowlitz spring and fall chinook and Wells summer chinook. IPNV and other replicating agents were negative in all stocks. Prevalence of EIBS was found to be only 0.83% in all species and stocks sampled. This is considerably different than what was seen in 1987 when EIBS was found in 19.6% of the fish sampled. The largest difference by species was for spring and fall chinook and early coho (Table 4).

Table 4. Erythrocytic Inclusion Body Syndrome prevalence in spawning adult salmon differentiated by species in 1987 and 1988.

SPECIES	% positive 1987	n	% positive 1988	n	Difference
Spring chinook	34.8%	307	0%	301	-34.3%
Fall chinook	22.7%	414	1.2%	420	-21.5%
Summer chinook	5.0%	60	0%	60	-5.0%
Early coho	20.2%	218	.33%	300	-19.9%
Late coho	2.0%	300	2.2%	240	+.2%

As discussed in Methods and Materials, the criteria for positive inclusions was more specific in 1988 than in 1987. This change, that inclusions must be 0.8 - 2.0u in diameter and stain light blue, probably had a great effect on the level of positive samples in 1988. We had seen in 1987 and again in 1988 frequent samples with only multiple small, (approximately 0.4 - 0.6u in diameter) dark staining inclusions. Because no larger light blue staining inclusions were seen these samples were called negative in 1988, but positive in 1987. Continuing evaluation of electron micrographs collected from positive juvenile stocks may revise this criteria. Since EIBS has been shown to be temperature regulated (Piacentini, 1989) a brief evaluation of temperature profiles during the adult holding period in 1987 and 1988 was

Table 3. Inspection Results of Returning Adults 1987 and 1988.

Species	Stock	Return Year	IHNV # Fish	IHNV Result	IPNV # Fish	IPNV Result	EIBS # Fish	EIBS Result	EIBS Percent Positive	BKD # Fish	BKD Result	BKD Percent Positive
Hatchery: Cowlitz												
Spring	Cowlitz	87	778	P	60	N	60	22	37	60	12	20
Spring	Cowlitz	88	2520	P	60	N	60	0	0	60	0	0
Fall	Cowlitz	87	2560	P	60	N	60	0	0	60	12	20
Fall	Cowlitz	88	4778	P	60	N	60	1	2	60	3	5
L. Coho	Cowlitz	R7	2519	N	120	N	60	0	0	60	33	55
L. Cohn	Cowlitz	88	5156	N	60	N	60	0	0	60	15	25
Hatchet-q Elokomin:												
Fall	Elokomln	87	60	N	60	N	60	1	2	60	1	2
Fall	Elokomln	88	994	N	60	N	60	3	5	60	1	2
L. Coho	Elokomln	87	60	N	60	N	60	3	5	60	8	13
L. Coho	Elokomln	88	699	N	NS		NS	–		NS		–
E. Coho	Elokomln	88	402	N	60	N	60	0	0	60	7	12
Hatchery: Grays River												
Fall	Grays River	87	60	N	60	N	60	24	40	60	12	20
Fall	Grays River	88	65	N	60	N	60	0	0	60	4	7
E. Coho	Grays River	87	60	N	60	N	60	4	7	60	2	3
E. Coho	Grays River	88	60	N	60	N	60	0	0	60	0	0
Hatchery: Kalama Falls												
Spring	Kalama Falls	87	120	N	60	N	60	31	52	60	2	3
Spring	Kalama Falls	88	223	N	60	N	60	0	0	60	0	0
L. Coho	Kalama Falls	87	60	N	60	N	60	1	2	60	0	0
L. Coho	Kalama Falls	88	60	N	60	N	60	4	7	60	0	0
Hatchery: Klickitat												
Spring	Klickitat	87	60	N	60	N	60	30	50	60	9	15
Spring	klickitat	88	60	N	60	N	60	0	0	60	3	5
Hatchery: Lewis River												
Spring	Lewis River	87	9	N								
L. Coho	Lewis River	87	60	N	60	N	60	2	3	60	15	25
L. Coho	Lewis River	RR	1192	N	60	N	60	0	0	60	3	5

Result: N negative P positive For species & stock # = # positive
NS not sampled.

Table 3. Inspection Results of Returning Adults 1987 and 1988.

Species	Stock	Return Year	IHNV # Fish	IHNV Result	IPN'J # Fish	IPN'J Result	EIBS # Fish	EIBS Result.	EIBS Percent Positive	BKD # Fish	BKD Result	BKD Percent Positive
Hatchery: Lower Kalama												
Fall	Kalama Falls	87	60	N	60	N	60	41	68	60	10	17
Fall	Kalama Falls	88	60	N	60	N	60	0	0	60	2	3
E. Coho	Lower Kalama	87	60	N	60	N	60	5	8	60	0	0
E. Coho	Kalama Falls	88	342	N	60	N	60	0	0	60	6	10
Hatchery: Lyons Ferry												
Spring	Tucannon	87	48	P	63	N	67	21	31	43	12	28
Spring	Tucannon	88	100	N	60	N	61	0	0	49	1	2
Fall	Lyons Ferry	87	1579	N	60	N	59	3	5	60	3	5
Fall	Lyons Ferry	88	60	N	60	N	60	1	2	60	1	2
Hatchery: Priest Rapids												
Fall	Priest Rapids	87	116	N	60	N	60	0	0	60	0	0
Fall	Priest Rapids	88	2617	N	60	N	60	0	0	60	1	2
Hatchery: Speelyai												
Spring	Lewis River	87	82	N	60	N	60	3	5	61	28	46
Spring	Lewis River	88	60	N	60	N	60	0	0	60	1	2
E. Coho	Lewis River	87	60	N	60	N	59	30	51	60	10	17
E. Coho	Lewis River	88	60	N	60	N	60	1	2	60	0	0
Sockeye	Wild	87	37	N								
Sockeye	Wild	88	7	N								
Hatchery: Washouga 1												
Fall	Washouga 1	87	148	N	60	N	60	26	43	60	12	20
Fall	Washouga 1	88	NS		60	N	60	0	0	60	3	5
E. Coho	Washouga 1	87	12	N	37	N	37	5	13	12	5	42
E. Coho	Washougal	88	87	N	60	N	60	0	0	60	0	0
L. Coho	Washouga 1	87	60	N	60	N	60	0	0	60	9	15
L. Coho	Washougal	88	60	N	60	N	60	1	2	60	3	5
Hatchery: Wells												
Summer	Wells	87	456	P	60	N	60	3	5	60	11	18
Summer	Wells	88	60	P	60	N	60	0	0	60	5	8

Result: N = negative P positive for species and stock # = # positive
NS = not sampled.

conducted. The difference in mean monthly temperature was +/- 2-4 F between 1987 and 1988. This minor difference probably had no effect on the level of EIBS found in the adults in the respective years.

Prevalence of BKD overall was also less in 1988 than in 1987, 4.5% versus 16.4%. The largest change by species was in the spring chinook (Table 5).

Table 5. Prevalence of Bacterial Kidney Disease in spawning adult salmon differentiated by species in 1987 and 1988.

SPECIES	% positive 1987	n	% positive 1988	n	Difference
Spring chinook	22.2%	284	1.7%	289	-20.5
Fall chinook	11.9%	420	3.6%	420	-8.3
Summer chinook	18.3%	60	8.3%	60	-10.0
Early coho	8.9%	192	4.3%	300	-4.6
Late coho	21.7%	300	8.8%	240	-12.9

The cause of the drop in prevalence of BKD in 1988 is unknown. Antibiotic (Erythromycin) injection treatments were very similar between 1987 and 1988. Possibly a difference in injection timing in relation to spawning may have had an effect on the efficacy of the drug treatment, and therefore an effect on the level of bacteria seen from the coelomic (ovarian) fluid samples, or simply a difference in year classes. Review of historic hatchery data for 1983 and 1984 spring chinook broods (returning as 4 year olds) showed that the 1984 brood spring chinook had more extensive Gallimyicin treatments for the prevention of BKD. These treatments may be reflected in the lower prevalence of BKD found in the 1988 returning adults.

Pre-spawning mortality was monitored extensively throughout the adult holding period by staff fish pathologists. Adult pre-spawning loss was attributed to the following diseases and conditions: BKD, Columnaris, Furunculosis, fungus (Saprolegnia), handling, Ichthyopthirius, Ceratomyxosis, chemical poisoning, and pre-spawning loss (normal). Causes of loss were very similar to those in 1987. Loss is detailed in the Disease Prevalence Summary Report (Appendix C).

Juvenile Analysis

Monthly monitoring visits were completed by staff fish pathologists throughout 1988. Monitoring visits have been very valuable in accurately determining cause of loss and attributing monthly loss to the appropriate cause or pathogen. Significant results from monthly monitoring in 1988 included: Dermocvstidium in 1986 brood Rocky Reach fall chinook, an intranuclear parasite (Michak and Rogers, 1989) in 1986 brood Wells summer chinook, Proliferative Kidney Disease (PKD) in 1987 brood Rocky Reach early coho and Chinook Lateral Line Syndrome (CHILLS) in Lyons Ferry fall chinook.

Monthly loss to specific bacterial pathogens CWD, BKD, ERM, and Furunculosis was examined for 1987 and 1988. Loss was enumerated by lower Columbia and upper Columbia hatcheries and

was the total number lost to the pathogen over all the hatcheries in that area. Loss to CWD in the lower Columbia basin hatcheries has been for the past two years substantially higher than loss to any other pathogen. Loss at the lower Columbia stations in 1988 was again very high and peaked in May, dropped off through August-September, and again had a minor elevation during October, following a very similar pattern shown in 1987 (Figure 2). Loss to CWD in the upper Columbia hatcheries in 1988 was overall much higher than in 1987, with high loss occurring in February and March, 1988 (Figure 3). Loss to BKD was elevated early in 1988, January through April, and dropped off completely for the remainder of the year. The loss pattern to BKD in 1988 was quite different than that seen in 1987 (Figures 4 & 5). Correlations of BKD prevalence between adults, and progeny during rearing will be possible beginning in 1989. Loss to ERM during 1988 at both lower and upper Columbia Basin hatcheries was also considerably higher than that seen in 1987 (Figures 6 & 7). The loss in the lower basin was mainly attributable to Klickitat hatchery spring chinook. Vaccine trials are planned for 1989 and will be reported on in the 1989 Annual Report. Upper Columbia 1988 losses were isolated epizootics at Lyons Ferry in April and May, and Priest Rapids in June. Loss to furunculosis in 1988 was negligible (Figure 8).

Pre-release exam results for 1986 brood yearling releases are presented in Table 6 with 1985 brood yearlings (sampled in 1987) for comparison. Viral exams for IHNV, IPNV and other replicable agents were positive only for IHNV in Lewis River spring chinook. At the time of sampling the Lewis River spring chinook appeared healthy, but within days of cytopathic effect showing in cell culture in the lab the fish at the hatchery were experiencing an epizootic. Total loss was undeterminable. Prevalence of EIBS was very low at 2.9% positive overall. The Lewis River coho, early and late mix, represented most of the positives (57%). This low prevalence compared with 72.3 % positive in 1987 may be reflective of the change in the positive criteria discussed earlier. Overall prevalence for BKD in 1988 was 34.4% positive. This was slightly higher than the 28.8% positive seen in 1987. It was stated in Michak and Rogers (1989) that we felt we had some false positives. This does not apply to the 1988 data because of the refinements we made to our technique.

Pre-release exams for the 1987 brood zero age releases sampled in 1988 are presented in Table 7. Additionally, zero age 1986 brood (sampled in 1987) are shown for comparison. Groups designated as delayed were released one to three months after the normal release. Viral assays for IHNV, IPNV and other replicating agents were negative. Prevalence of EIBS for all species and stocks was 4.3%, significantly lower than the 48.3 % positive seen in 1987. The Wells summer chinook again had a higher than average prevalence for EIBS. Again the criteria for positive samples may have played a role in the overall lower prevalence in 1988. The overall prevalence of BKD was 30.0%, higher than 5.0% seen in 1987. The higher prevalence was not restricted to one location/species, but spread throughout the groups.

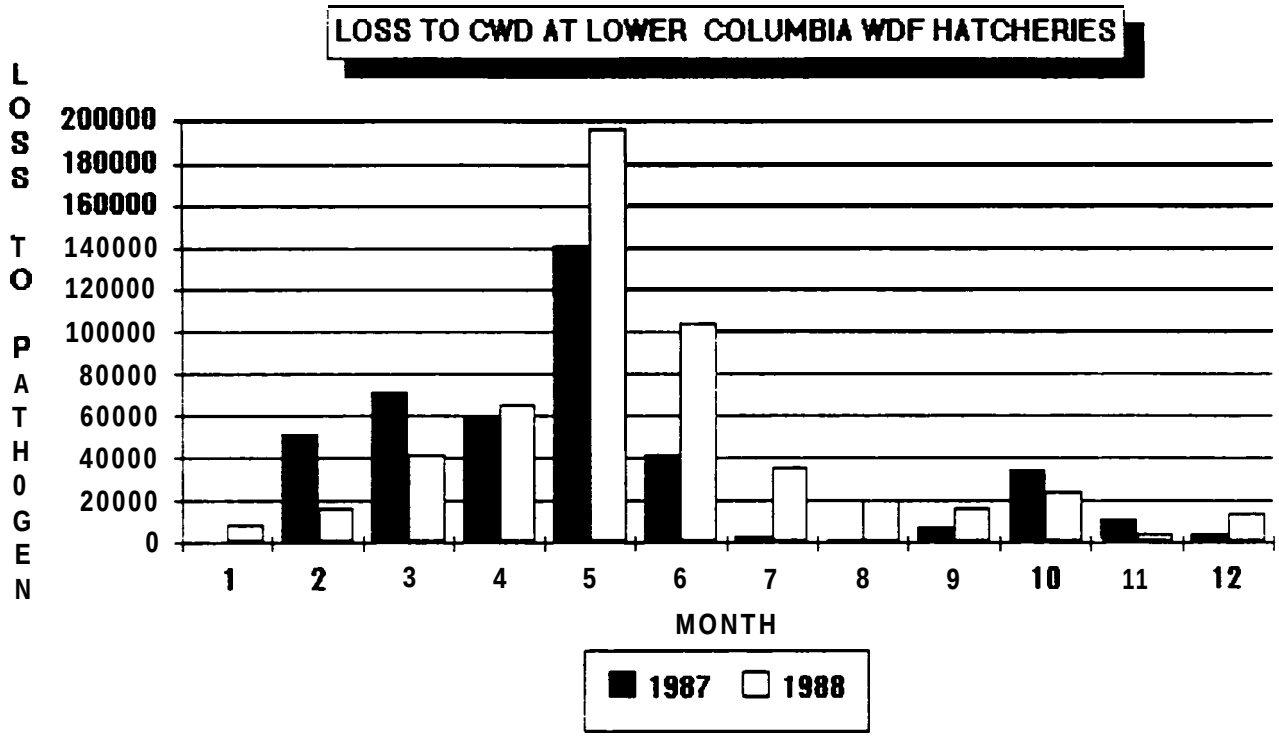


Figure 2. Juvenile loss to Coldwater Disease at WDF lower Columbia hatcheries, 1987 and 1988.

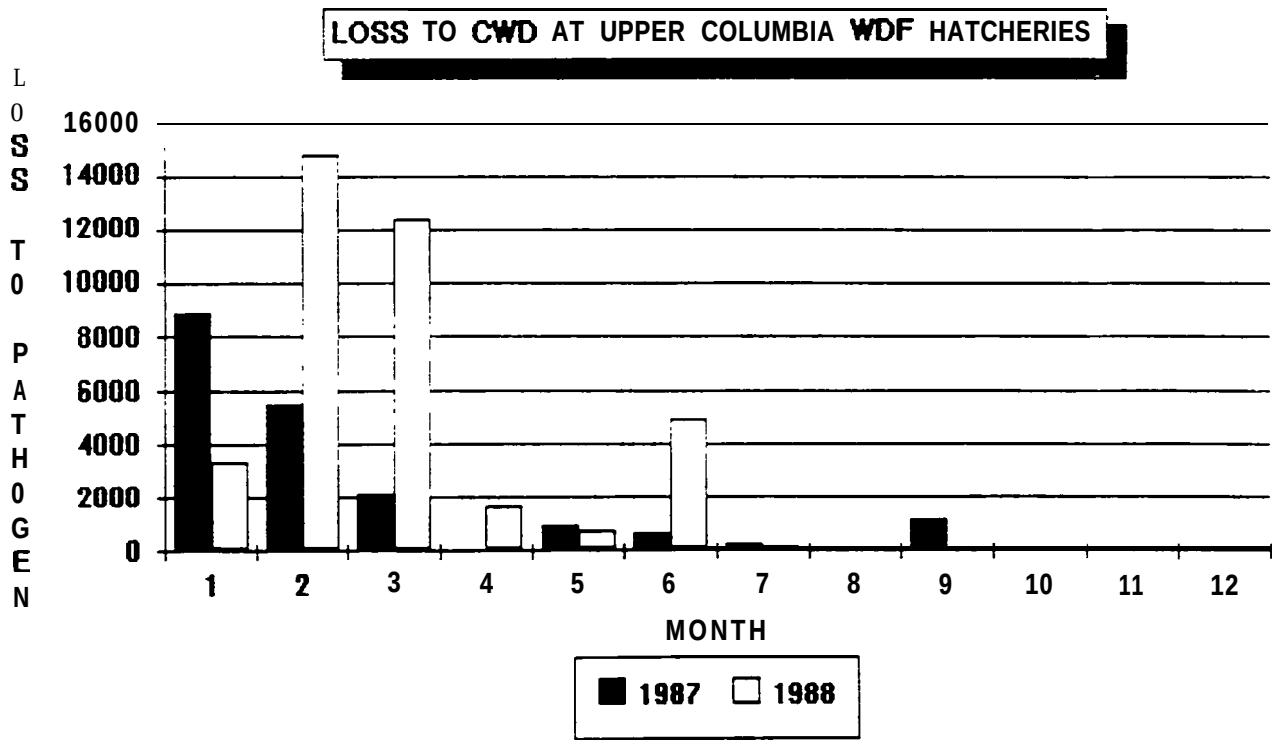


Figure 3. Juvenile loss to Coldwater Disease at WDF upper Columbia hatcheries, 1987 and 1988.

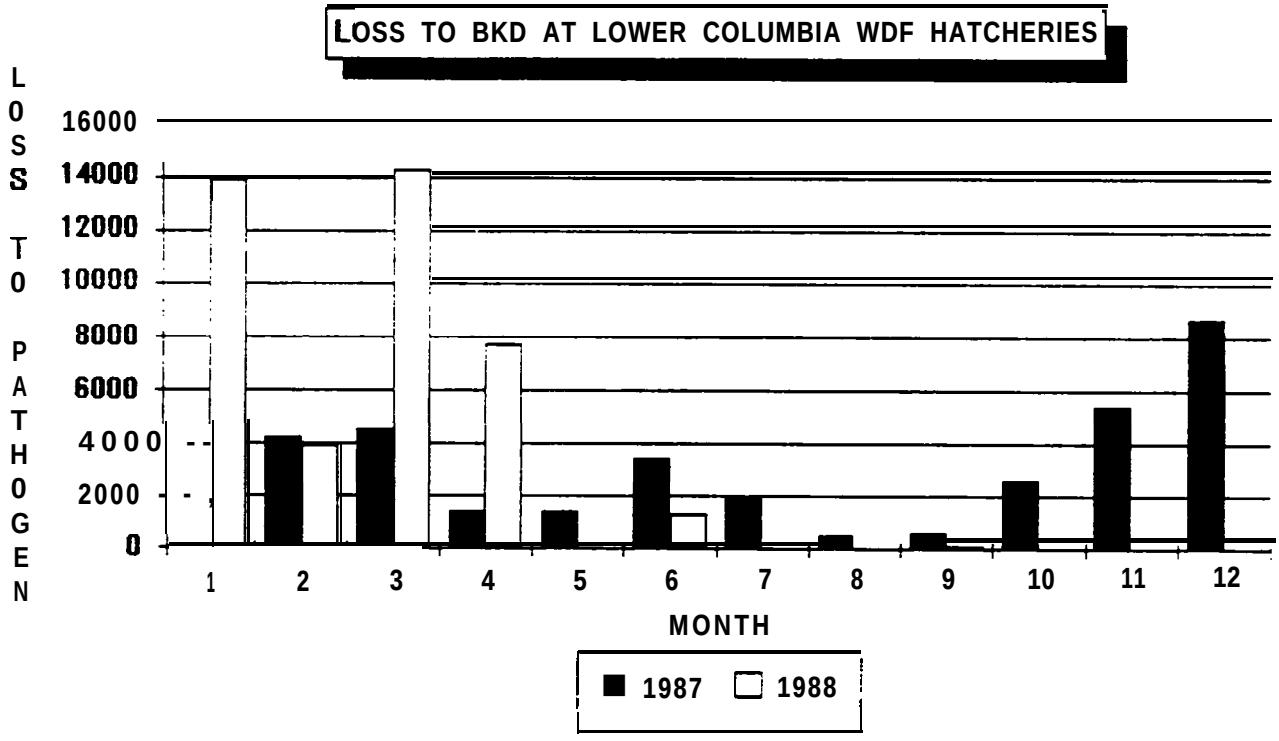


Figure 4. Juvenile loss to Bacterial Kidney Disease at WDF lower Columbia hatcheries, 1987 and 1988.

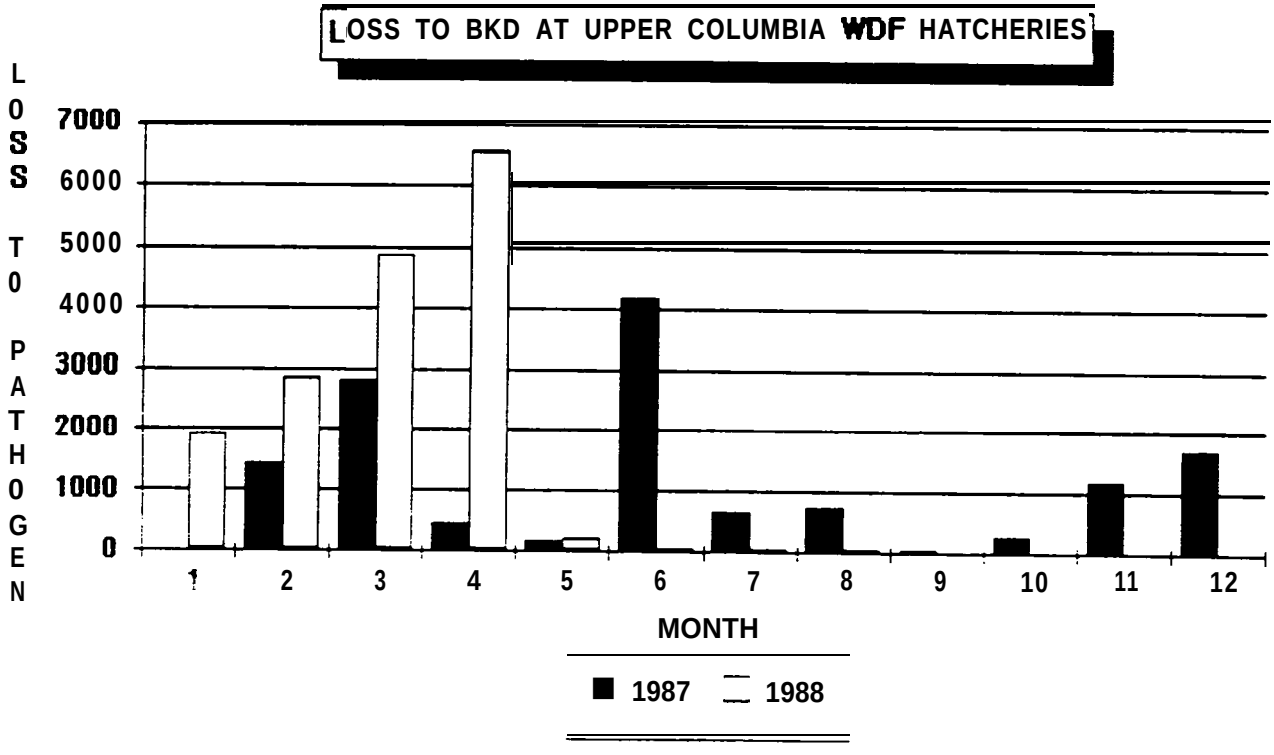


Figure 5. Juvenile loss to Bacterial Kidney Disease at WDF upper Columbia hatcheries, 1987 and 1988.

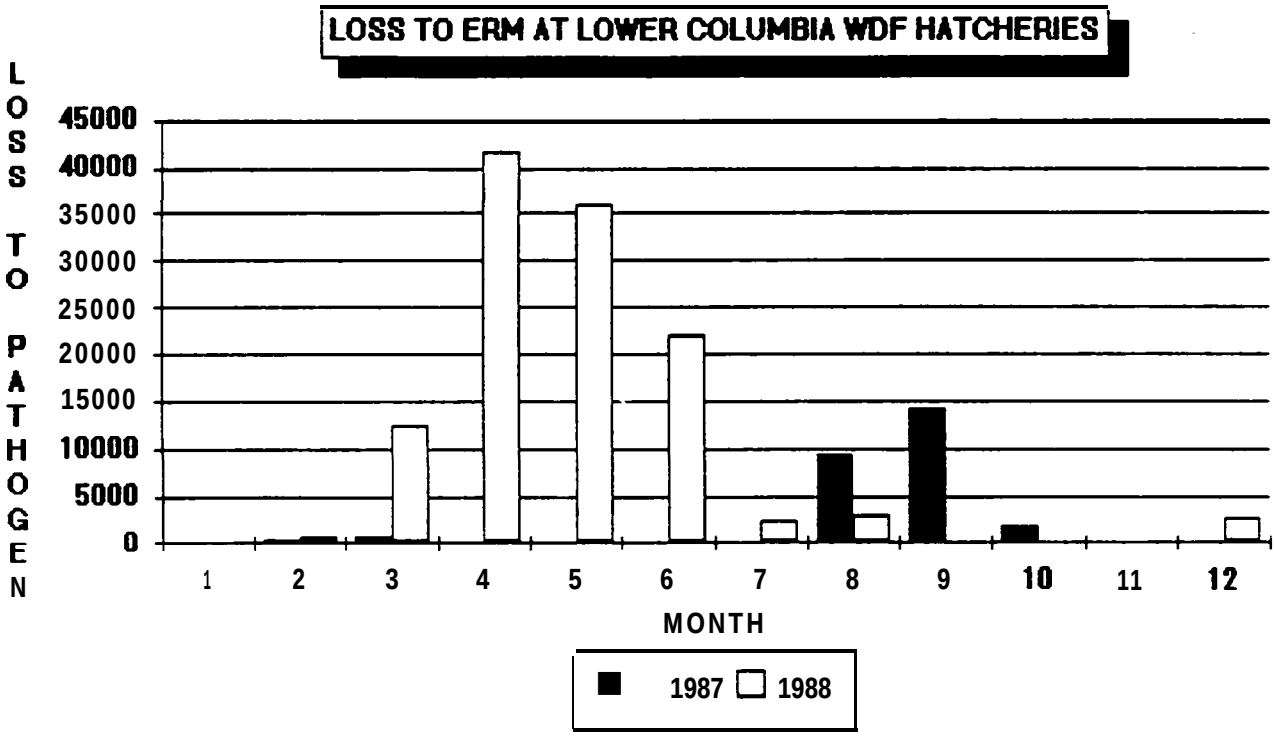


Figure 6. Juvenile loss to Enteric Redmouth at WDF lower Columbia hatcheries, 1987 and 1988.

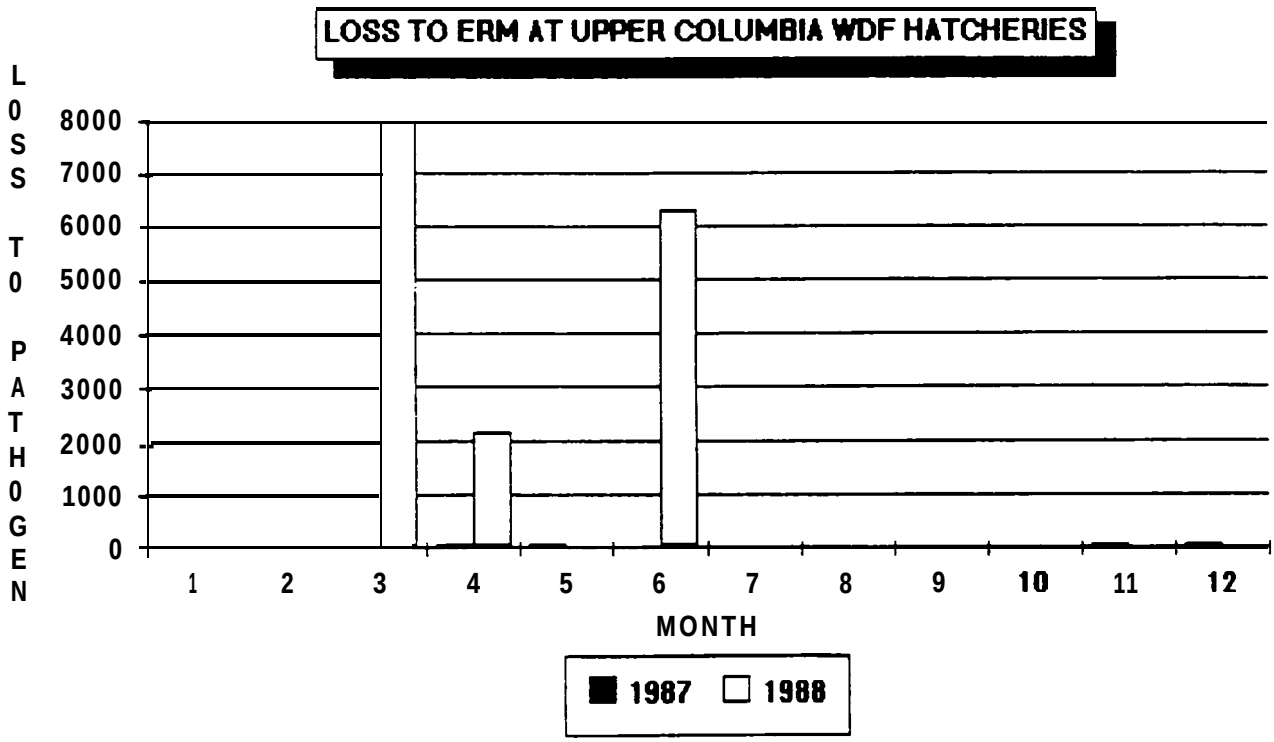


Figure 7. Juvenile loss to kteric Redmouth at WDF upper Columbia hatcheries, 1987 and 1988.

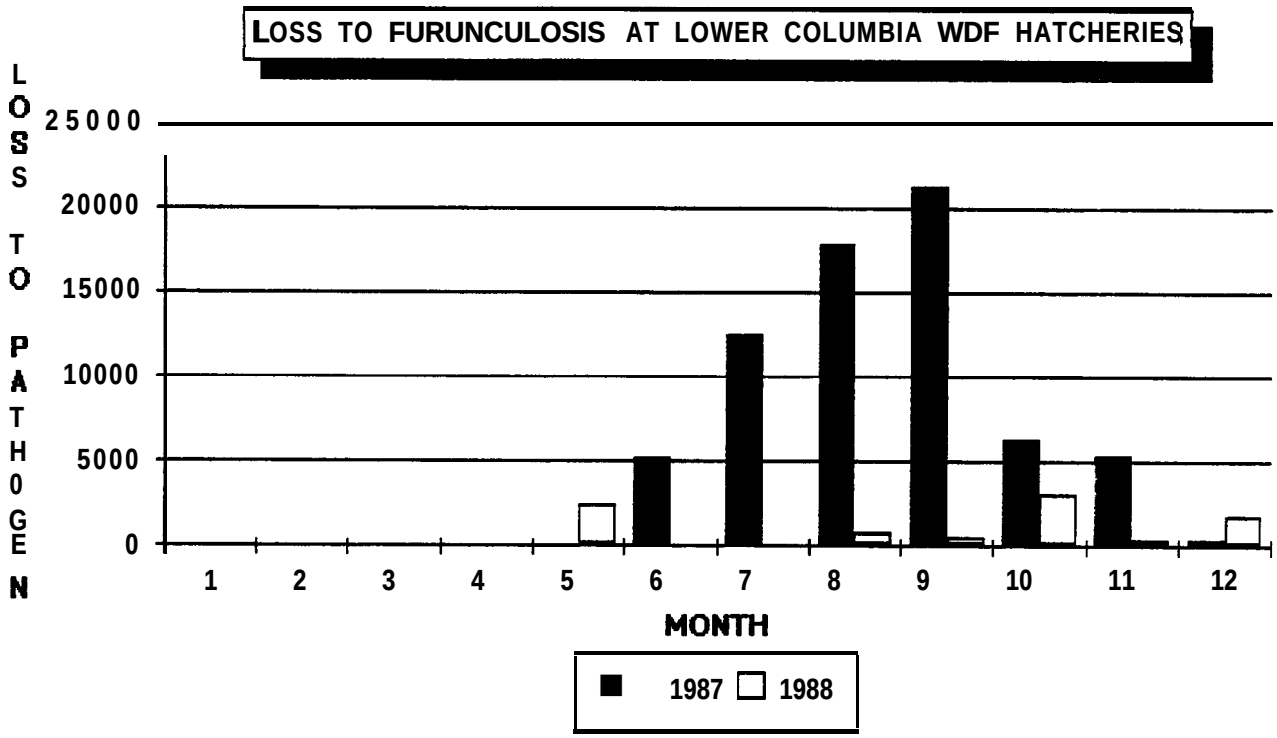


Figure 8. Juvenile loss to Funmculosis at WDF lower Columbia hatcheries, 1987 and 1988.

Table 6. Pre-Release **Sampling Results — Yearling Rge Releases 1987** and **1988.**

Species	Stock	Brood Year	I HNV # Fish	I HNV Result	IPNV # Fish	IPNV Result	EIBS # Fish	EIBS Result	EIBS Percent Positive	BKD # Fish	BKD Result	BKD Percent Positive
Hatchery:	**Cowlitz**											
Spring	**Cowlitz**	85	**60**	N	**60**	N	59	**56**	95	**60**	**44**	**7** 3
Spring	**Cowlitz**	**86**	**60**	N	**60**	N	**60**	1	**2**	**60**	**16**	**27**
L. Coho	**Cowlitz**	**85**	**60**	N	**60**	N	**60**	**52**	**87**	**60**	1	**2**
L. Coho	**Cowlitz**	**86**	**60**	**N**	**60**	N	**60**	**0**	**0**	**60**	**5**	**8**
Hatchery:	**Elokomin**											
L. Coho	**Elokomin**	**85**	**60**	N	**60**	N	**60**	**7**	**12**	**60**	**16**	**27**
L. Coho	**Elokomin**	**86**	**60**	N	**60**	N	**60**	**0**	**0**	**60**	**5**	**8**
Hatchery:	Grays **River**											
E. Coho	Grays **River**	**85**	**60**	N	**60**	N	**60**	**51**	**85**	**62**	**0**	**0**
E. Coho	Grays **River**	. **86**	**60**	N	**60**	N	**60**	**0**	**0**	**60**	**7**	**12**
Hatchery:	**Kalama Falls**											
L. Coho	**Kalama Falls**	**85**	**60**	N	**60**	N	**60**	**42**	**70**	**60**	**20**	**33**
L. Coho	**Kalama Falls**	**86**	**60**	N	**60**	N	**60**	**4**	**7**	**60**	**10**	**17**
Spring	**Kalama Falls**	**86**	**60**	N	**60**	N	**60**	**0**	**0**	**60**	**0**	**0**
Hatchery:	**Klickitat**											
Spring	**Klickitat**	**85**	**60**	N	**60**	N	**60**	**49**	**82**	**60**	**0**	**0**
Spring	**Klickitat**	**86**	**60**	N	**60**	N	**60**	**0**	**0**	**60**	**31**	**52**
L. Coho	**Klickitat**	**85**	**60**	N	**60**	N	**60**	**60**	**100**	**60**	1	**2**
L. Coho	**Klickitat**	**86**	**60**	N	**60**	N	**60**	1	**2**	**60**	**48**	**8** 0
Hatchery:	**Lewis River**											
Spring	**Lewis River**	**85**	**60**	N	**60**	N	**60**	**60**	**100**	**60**	**34**	**57**
Spring	**Lewis River**	**86**	**60**	P	**60**	N	**60**	**0**	**0**	**60**	**22**	**37**
L. Coho	**Lewis River**	**85**	**60**	N	**60**	N	**60**	**51**	**85**	**60**	**48**	**80**
E&L Coho	**Lewis River**	**86**	**60**	N	**60**	N	**60**	**20**	**33**	**60**	**37**	**62**
Hatchery:	Lower Kalama											
E. Coho	Lower **Kalama**	**85**	**60**	N	**60**	N	**60**	**45**	**75**	**60**	**23**	**38**
E. Coho	**Kalama Falls**	**86**	**60**	N	**60**	N	**60**	**0**	**0**	**60**	**40**	**67**

Result: N = **negative** P = **positive** for **species** and stock **# = # positive**

Table 6. Pre-Release Sampling Results – Yearling Age Releases 1987 and 1988.

			IHNV		IPNV		EIBS			BKD		
Species	Stock	Brood Year	# Fish	Result	# Fish	Result	# Fish	Result	Percent Positive	# Fish	Result	Percent Positive
Hatchery: Lyons Ferry												
Fall	Lyons Ferry	85	60	N	60	N	60	52	87	60	45	75
Fall	Lyons Ferry	86	60	N	60	N	60	0	0	60	20	33
Hatchery: Ringold												
Fall	Ringold	85	60	N	60	N	60	54	90	60	48	80
Spring	Ringold	86	60	N	60	N	60	0	0	60	6	10
Hatchery: Rocky Reach												
Fall	Priest	85	60	N	60	N	59	37	63	60	0	0
Fall	Rocky Reach	86	60	N	60	N	60	4	7	60	37	62
L. Coho	Rocky Reach	85	60	N	60	N	60	10	17	60	1	2
E. Coho	Rocky Reach	86	60	N	60	N	60	0	0	60	28	47
Hatchery: Speelyai												
Spring	Speelyai	86	60	N	60	N	60	0	0	60	20	33
Hatchery: Tout le												
E. Coho	Toutle	86	60	N	60	N	60	1	2	60	37	62
Hatchery: Tucannon												
Spring	Tucannon	85	30	N	30	N	30	28	93	30	21	70
Spring	Tucannon	86	60	N	60	N	60	4	7	60	13	22
Hatchery: Washouga 1												
E. Coho	Washougal	85	60	N	60	N	60	33	55	60	0	0
L. Coho	Washougal	85	60	N	60	N	59	54	92	60	0	0
L. Coho	Washougal	86	60	N	60	N	60	0	0	60	0	0
Hatchery: Wells Spawning Channel												
Summer	Wells	85	60	N	60	N	60	16	27	60	1	2
Summer	Wells	86	60	N	60	N	60	0	0	60	31	52

Result: N = negative, P = positive for species and stock # = # positive

Table 7. Pre-Release Sampling Results - Zero Rge Releases, 1987 and 1988.

Species	Stock	Brood Year	IHNV # Fish	IHNV Result	IPNV # Fish	IPNV Result	EIBS # Fish	EIBS Result	EIBS Percent Positive	BKD # Fish	BKD Result	BKD Percent positive	Comments
Hatchery: Cowlitz													
Spring	Cowlitz	86	60	N	60	N	60	28	47	60	19	32	
Spring	Cowlitz	87	60	N	60	N	60	0	0	60	4	7	
Fall	Cowlitz	86	60	N	60	N	60	18	30	60	5	8	
Fall	Cowlitz	87	60	N	60	N	60	0	0	60	39	65	
Fall	Cowlitz	86	60	N	60	N	60	32	53	60	1	2	Delayed release
Fall	Cowlitz	87	60	N	60	N	60	15	25	60	0	0	Delayed release
Hatchery: Elokomin													
Fall	Elokomin	86	60	N	60	N	60	29	48	60	0	0	
Fall	Elokomin	87	60	N	60	N	60	0	0	60	57	95	
Hatchery: Grays River													
Fall	Grays River	86	60	N	60	N	60	24	40	60	0	0	
Fall	Grays River	87	60	N	60	N	60	0	0	60	2	3	
Fall	Grays River	86	57	N	57	N	56	37	66	57	0	0	Oelayed 'release
No delayed release in 1988.													
Hatchery: Kalama Falls													
Fall	Kalama Falls	86	60	N	60	N	60	25	42	60	0	0	
Fall	Kalama Falls	87	60	N	60	N	60	0	0	60	20	33	
Hatchery: Klickitat													
Fall	Priest Rapids	86	60	N	60	N	60	19	32	60	3	5	
Fall	Priest Rapids	86	60	N	60	N	60	32	53	60	0	0	Delayed release
Fall	Klickitat	86	60	N	60	N	60	19	32	60	0	0	
Fall	Klickitat	87	60	N	60	N	60	0	0	60	9	15	
Spring	Klickitat	87	60	N	60	N	60	1	2	60	8	13	
Hatchery: Lower Kalama													
Fall	Lower Kalama	86	60	N	60	N	60	28	46	60	2	3	
Fall	Lower Kalama	87	60	N	60	N	60	0	0	60	34	57	
Hatchery: Lyons Ferry													
Fall	Lyons Ferry	86	60	N	60	N	60	38	63	60	0	0	
Fall	Lyons Ferry	87	60	N	60	N	60	0	0	60	22	37	

Result: N = negative P = positive # = # positive

Table 7. Pt-e-Release Sampling Results - Zero Rge Releases, 1987 and 1988.

Species	Stock	Brood Year	IHNV # Fish	IHNV Result	IPNU # Fish	IPNU Result	EIBS # Fish	EIBS Result	EIBS Percent Positive	BKD # Fish	BKD Result	BKD Percent positive	Comments
Hatchery: Priest Rapids													
Fall	Priest Rapids	86	60	N	60	N	60	25	42	60	0	0	
Fall	Priest Rapids	87	60	N	60	N	60	0	0	60	13	22	
Hatchery: Rocky Reach													
Fall	Rocky Reach	86	60	N	60	N	60	24	40	60	0	0	
No zero release in 1988.													
Hatchery: Tout le													
Fall	Toutle	87	60	N	60	N	60	0	0	60	10	17	
Hatchery: Washouga 1													
Fall	Washouga 1	86	60	N	60	N	60	24	40	60	20	33	
Fall	Washougal	87	60	N	60	N	60	0	0	60	22	37	
Hatchery: Wel ls Spawning Channel													
Summer	Wells	86	60	N	60	N	60	51	85	60	0	0	
Summer	Wells	87	60	N	60	N	60	20	33	60	12	20	
Summer	Wells	86	60	N	60	N	60	38	63	60	1	2	Oelayed release
No delayed release in 1988.													

Result: N = negative P = positive # = # positive

Hematocrit data has been collected during pre-release exams on all release groups since 1987. That data has been summarized by species for yearling and subyearling "zero" age releases (Appendix G). The raw data for 1988 is also presented in Appendix G. A brief summary by species and release age of mean hematocrit and mean hematocrit range are presented in Table 8.

Table 8. Mean hematocrit and Mean Hematocrit Range by species and release age.

Species	Age	Mean Hematocrit	Mean Hematocrit Range
Spring chinook	yearling	34.3	32.9 - 43.4
Fall chinook	yearling	41.7	38.4 - 43.7
Summer chinook	yearling	34.5	34.2 - 34.8
Late coho	yearling	35.6	29.8 - 41.6
Early coho	yearling	32.4	27.1 - 37.9
Fall chinook	zero	35.1	29.2 - 42.6

Midterm Exams

Results of midterm BKD and *Mvxobolus cerebralis* exams for 1987 and 1988 are presented in Table 9. Midterm BKD exams showed a considerably higher prevalence of BKD in 1988, 6.8% for all species, than the 0.2% positive found in 1987. Forty percent of the positives in 1988 were attributable to the Tucannon spring chinook. With removal of the Tucannon data the overall prevalence in 1988 was 4.1% still considerable higher than 1987. All assays for M. *cerebralis* were negative.

Organosomatic Analysis - Index Stocks

The Organosomatic Index Analysis, developed by Ron Goede of the Utah Division of Wildlife Resources, was performed on sixty fish from each index stock listed in Table 10. Lewis River early coho was selected in 1988 as the early coho index stock to replace the Lower Kalama early coho, which was incorrectly identified as a coded wire tag index group.

Table 10. Organosomatic Analysis - Index Stocks.

Hatchery	Stock	Year Class
Cowlitz	Spring Chinook	Yearling and normal release subyearling.
Cowlitz	Fall Chinook (Tule)	Yearling. Normal and delayed release subyearling.
Lyons Ferry	Fall Chinook (URB)	Yearling and normal release subyearling.
Lewis River	Early Coho	Yearlins.

-Table 9. Midterm Sampling Results, 1987 and 1988.

Species	Stock	Brood Year	BKD Fish	BKD Result	Percent Positive	M.C. Ffsh	M.C. Result
Hatchery: Cowlitz							
Spring	Cowlitz	86	60	0	0	72	N
Spring	Cowlitz	87	60	6	10	60	N
L. Coho	Cowlitz	86	60	1	2	--	
L. Coho	Cowlitz	87	60	1	2	--	
Hatchery: Elokomin							
L. Coho	Elokomin	86	60	0		--	
L. Coho	Elokomin	87	60	0		--	
E. Coho	Grays River	87	60	0	I	--	
Hatchery: Grays River							
Fall	Grays River	86	--		-	57	N
E. Coho	Grays River	86	60	0	0	--	-
Hatchery: Kalama Falls							
Spring	Kalama Falls	86	60	0	0	60	N
Spring	Kalama Falls	87	60	2	3	60	N
L. Coho	Kalama Falls	86	60		0	--	-
L. Coho	Kalama Falls	87	60	4	3	--	-
Hatchery: Klickitat							
Spring	Klickitat	86	60	0	0	60	N
Spring	Klickitat	87	60	7	12	--	-
L. Coho	Klickitat	86	60		0	--	-
L. Coho	Klickitat	87	60	8	15	--	-
Hatchery: Lewis River							
Spring	Lewis River	86	60	0	0	60	N
Spring	Lewis River	87	60	2	3	60	N
L. Coho	Lewis River	86	60			--	
L. Coho	Lewis River	87	60	8	8	--	
Hatchery: Lower Kalama							
E. Coho	Lower Kalama	86	60	0	0	--	
Hatchery: Lyons Ferry							
Fall	Lyons Ferry	86	60	0	0	--	
Fall	Lyons Ferry	87	60	6	10	--	
Hatchery: Priest Rapids							
Fall	Priest Rapids	87	--			60	N
Hatchery: Ringold							
Spring	Wind River	86	60	0	0	60	N
Hatchery: Rocky Reach							
Fall	Rocky Reach	86	60	0	0	60	N
Fall	Rocky Reach	87	60	0	0	--	
E. Coho	Rocky Reach	86	60	0	0	--	
E. Coho	Rocky Reach	87	60	2	3	--	
Hatchery: Speelyai							
Spring	Speelyai	86	60	0	0	60	N
E. Coho	Lewis River	86	60	0	0	--	
E. Coho	Speelyai	87	60	2	3	--	
Hatchery: Tucannon							
Spring	Tucannon	86	60	1	2	60	N
Spring	Tucannon	87	60	29	48	--	
Hatchery: Washougal							
L. Coho	Washougal	86	60	0		--	
L. Coho	Washougal	87	60	0		--	
E. Coho	Kalama Falls	87	60	2	8	--	-
Fall	Washougal	87	--			60	N
Hatchery: Wells Spawning Channel							
Summer	Wells	86	60	0	0	60	N
Summer	Wells	87	60	3	5	--	

M.c. = *Myxobolus cerebralis*
Result: N = negative P = positive for species & stock # = # positive

Organosomatic analyses were conducted.on seven release lots and analysis of the results is outlined below. The computer generated summaries and raw data are listed in Appendix H. Additional observations included in all autopsies in 1988 were bile (gall bladder) condition and blood serum protein level.

Cowlitz spring chinook yearlinss 1986 brood

The 1986 brood year (BY86) Cowlitz spring chinook yearling lot, released in 1988, exhibited abnormalities of the thymus, pseudobranchs, and gills. A comparison to the 1987 release (BY85) indicated a marked increase in the percentage of abnormal thymus and pseudobranchs, an equal prevalence of pale gills, a marked reduction in the observation of enlarged spleens, and a slight increase in swollen kidneys (Table 11). Swelling or hemorrhaging of the thymus or pseudobranch, often precipitated by stress, is expected in a small percentage of hatchery reared fish, but the prevalence observed indicates additional stressors may have affecting this lot. Results of fluorescent antibody technique (FAT) screening of kidney tissue smears determined that 11 of 16 positive samples had <10 bacteria (*Renibacterium salmoninarum*) per 30 fields, 4 samples had >lO but <100, and one had >lOOO. The coefficient of variation of total fish lensth for the 1988 release was 14%, compared to 12% for the 1987 release. Hematocrit coefficient of variation of the 1988 sample lot was 20%, compared to 13% for the 1987 sample lot.

Table 11. Comparison of observed tissue abnormalities at Cowlitz hatchery, yearling spring chinook releases for 1987 & 1988.

	Abnormal Observations				
Release Year	Mild Hemorrhage Thymus	Abnormal Pseudobranch	Pale Gill	Enlarged Spleen	Swollen Kidney
1987	27%	23%	7%	2%	5%
1988	10%	0%	7%	40%	2%

: 7% swollen, 2% lithic, 12% swollen and lithic & 3% other

Lewis River early coho Yearlings 1986 Brood

The BY86 Lewis River early coho lot, released in 1988, exhibited an 8% prevalence of enlarged spleens and an abnormally broad range of bile values. The reason(s) for the level of enlarged spleens is unknown but it is interesting to note that cytoplasmic inclusions were observed in erythrocytes in 20 of 60 blood films and that 37 of 60 kidney tissue smears were positive for the presence of R. *salmoninarum* (33 with <10 bacteria per field, 4 with >lO but <100). Evidence presented by Steve C. Piacentini, H. V. Lorz, and J. S. Rohovec at the American Fisheries Society Oregon Chapter Annual Meeting and Symposium in

Bend, Oregon during February, 1989, suggests that splenomegaly (enlarged spleens) may be, at least partly, a result of increased splenic hematopoiesis during the erythrocyte destruction phase of an EIBS episode. The hematocrit data for this lot showed a mean value of 32.9 and a coefficient of variation of 13%. Gall bladder observations suggested that 29% of the sample lot had not ingested feed for at least 4 days prior to the OSI sampling.

Lyons Ferry fall chinook vearlinss 1986 Brood

The BY86 (1988 release) Lyons Ferry fall chinook yearling lot autopsy summaries are included both as a single sixty. fish sample and as two thirty fish samples based on release strategy. A comparison, by release year, of abnormal tissue observations is listed in Table 12. The on-station yearling release lot (60.5% of station yearling production) is represented by samples #l-30 of the autopsy summary. The barged yearling release lot (39.5% of station yearling production), is represented by samples #31-60. This lot was transported from the hatchery to a release site below Ice Harbor Dam. A comparison of the autopsy summaries by release strategy suggests that both the station release lot and the barge lot were subjected to stressors as indicated by the high level of hemorrhaging of the thymus. In addition, it suggests that the station release lot was subjected to a stressor(s) to a greater degree (Table 12). The reason for this high level is unknown but it may be partly due to the presence of R. salmoninarum. Low levels of bacteria (<10 per 30 fields) were observed in 20 of 60 kidney smears. Fat levels of +1 or greater were observed in 60% of the station release fish and 46% of the barge release fish.

Table 12. Comparison of observed tissue abnormalities at Lyons Ferry hatchery, yearling fall chinook releases.

Abnormal Observations

Release Year	Mild Hemorrhage Thvmus	Inflamed Pseudobranch	Pale Gill	Enlarged Spleen	Swollen Kidney
1987	18%	7%	0%	0%	0%
1988 (60 fish)	47% [1]	0%	0%	5% [2]	0%
1988 on station	53% [3]	0%	0%	10% [4]	0%
1988 barged	40%	0%	0%	0%	0%

[1] 2% severe hemorrhage
[2] 2% nodular
[3] 3% severe hemorrhage
[4] 3% nodular

Cowlitz fall chinook subyearling normal and delayed release 1987 Brood

The BY87 Cowlitz fall chinook subyearling lot, released in 1988, appeared in good condition with the exception of fat levels of 0 (no fat) in 13% of the sampled fish. By comparison, only 2% of the subyearling lot released in 1987 had fat levels of 0. Mean fat levels for 1988 and 1987 were, 1.0 and 1.2, respectively. Gross observation of the kidney indicated no abnormalities, however results of FAT screening indicated low levels (<10 bacteria per 30 fields) of R. salmoninarum were present in 33 of the 39 positive kidney tissue smears.

The BY87 Cowlitz fall chinook (subyearling) delayed release lot, sampled in 1988, exhibited signs of stress similar to the delayed release lot sampled in 1987. Abnormal thymus and spleen observations increased but the prevalence of abnormal gills decreased (Table 13). A comparison of the summary reports of normal release lots to delayed release lots for 1988 and 1987 suggests that the delayed groups were subjected to an increased level of stress during the extended rearing period. This is evidenced primarily by an increase in abnormal thymus observations and, to a lesser extent, in the increase of abnormal gill and pseudobranch observations (Table 14). The mean value of thymic condition for the 1988 normal release lot and 1988 delayed release lot was 0.0 and 0.4, respectively. The mean value of thymic condition for the 1987 normal release lot and 1987 delayed release lot was 0.0 and 0.3, respectively. Fat deposits were greater in the delayed release lots than in the normal release lots during both 1988 and 1987. The mean fat levels during 1988 were 1.6 (delayed) and 1.0 (normal) and in 1987, 1.7 (delayed) and 1.2 (normal).

Table 13. Comparison of observed tissue abnormalities in Cowlitz fall chinook delayed releases in 1987 & 1988.

	Abnormal Observations				
Release Year	Mild Hemorrhage Thymus	Inflamed Pseudobranch	Pale Gill	Enlarged Spleen	Swollen Kidney
1987	28% [1]	2%	13%	3%	0%
1988	33% [2]	0%	5%	5%	0%

[1] 5% severe hemorrhage
[2] 3% severe hemorrhase

Table 14. Comparison of observed tissue abnormalities between Cowlitz fall chinook normal and delayed lots, by release year.

Release Year	Type Release	Mild Hemorrhage Thvmus	Inflamed Pseudobranch	Pale Gill	Enlarged Spleen	Swollen Kidney
		Abnormal Observations				
1988	Normal	3%	0 %	0%	2%	0%
	Delayed	33% [1]	0%	5%	5%	0%
1987	Normal	2%	0%	2%	5%	0%
	Delayed	28% [2]	2%	13%	3%	0%

[1] 3% severe hemorrhage
[2] 5% severe hemorrhase

Lyons Ferry fall chinook subvearlina 1987 Brood

The BY87 Lyons Ferry fall chinook subyearling lot, released in 1988, exhibited only minor deviations from desired conditions. Swollen pseudobranchs were evident in 3% of the sampled fish and fatty livers in 2%. Gross observation of the-kidney revealed no abnormalities, however 22 of 60 tissue smears were determined positive for the presence of R. salmoninarum (18 of the 22 contained <10 bacteria per 30 fields). Total fish length coefficient of variation increased to 10% for BY87 (1988 sampling) from 8% for BY86 (1987 sampling).

Cowlit spring chinook subvearlins 1987 Brood

The BY87 Cowlitz spring chinook subyearling lot, released in 1988, also exhibited only minor abnormalities, the most notable of which was fat levels of 0 in 17% of the sample lot. A marked reduction of enlarged spleens to 2% in BY87 (1988 sampling) from 13% in BY86 (1987 sampling) was observed.

SPECIAL PROJECTS

Chinook Lateral Line Syndrome (CHILLS)

Chinook Lateral Line Syndrome (CHILLS) is a disease of fall chinook salmon that was first observed at a single WDF hatchery in 1962, was widespread in most Washington hatcheries during 1963, but was not reported to occur again until 1985 when it was noted in fall chinook yearlings at Lyons Ferry Hatchery. CHILLS also occurred in Lyons Ferry fall chinook during 1986 and was observed again during 1988. Efforts have been made to identify the cause of CHILLS since its reemergence at Lyons Ferry in 1985 and continued during 1988 and 1989.

Signs of CHILLS in Lyons Ferry fall chinook prior to 1988 included ones similar to those reported by Wood (1968) and

Parisot et al (1965) and include hemorrhage, congestion and degeneration of the muscle in the area of the lateral line, pale gills and elevated mortality. CHILLS at Lyons Ferry differed from earlier cases in several ways, however. Fish affected with the disease at Lyons Ferry have been yearlings as opposed to the O-age fish affected during the 1960's and so were much larger, ranging between 10 and 35/lb. CHILLS affected fish at Lyons Ferry have been noted to exhibit signs not reported to occur in the 1960's, including fluid filled stomachs, enlarged spleens, hemorrhage, congestion and degeneration of the myocardium and cytoplasmic inclusions within red blood cells (EIBS). Mortality was not severe and peaked in individual ponds at approximately 0.35% weekly. Elevated mortality occurred for approximately 2 months, resulting in total mortality of about 1.3%.

No cause of CHILLS was determined in the 1960's, although the disease did not recur following elimination of raw salmon viscera from fish feeds. Investigations at Lyons Ferry also have failed to identify the cause of the disease. Routine bacterial and viral assays have failed to isolate pathogens. Raw salmon viscera is not used in modern fish feeds and so cannot be implicated. Electron microscopic examinations during 1985 were inconclusive and transmission experiments conducted by Jim Winton failed to transmit the disease.

Investigations during 1988 and 1989 concentrated an elucidating the association of EIBS and CHILLS at Lyons Ferry. CHILLS occurred from September through December of 1988 in fall chinook yearlings ranging between 25 and 35/lb. Previously described signs were observed in affected fish, but pale yellowish livers were also noted. Hematocrits and serum protein values of CHILLS affected fish were always less than 10% and 2.3 g/dL, respectively. Furthermore, it was observed that 1) the occurrence of CHILLS in mortalities from a particular pond always followed the diagnosis of EIBS in fish from that pond by three weeks, 2) following the diagnosis of EIBS in fish from a pond, average hematocrit for that population declined to a low of 24% at which time cytoplasmic inclusions were no longer observed and hematocrits recovered to normal, 3) fish with CHILLS always contained at least some red blood cells with cytoplasmic inclusions, 4) viral particles were confirmed in red blood cells containing cytoplasmic inclusions by Charlie Smith and Beth MacConnell of the U.S. Fish and Wildlife Service, Bozeman, Montana and Andy Blixt of Montana State University, Bozeman, Montana through electron microscopy. Virions were observed in bloods taken from fish suffering only from EIBS as well as from fish suffering from CHILLS and EIBS. Virions observed'were similar to those reported by Leek (1987), 5) CHILLS could be found in mortalities from a pond for only three weeks, 6) CHILLS was only observed in dead or dying fish and never from randomly selected "healthy" fish, 7) once EIBS could no longer be found in fish from the pond, CHILLS also could no longer be found in mortalities from that pond.

Mortality to CHILLS in 1988 was similar to that seen in 1985, peaking in the most severely affected ponds at 0.45% weekly. Total mortality was approximately 1.5% and elevated

mortality lasted as long as 12 weeks in some ponds but only 4 weeks in others.

The cause of CHILLS has yet to be determined. Again in 1988, bacterial and viral assays were negative and the only factor that appeared to correlate with the occurrence of CHILLS was the presence of EIBS. However, other hatchery populations of chinook salmon have been observed to have EIBS but not CHILLS and, during the spring of 1989, O-age fall chinook salmon at WDF's George Adams hatchery on Hood Canal were observed to be suffering from CHILLS but not EIBS. Interestingly, Tucannon stock spring chinook yearlings held at Lyons Ferry were not observed to have EIBS until November. These fish were being transferred to Tucannon hatchery at that time for further rearing prior to release in April. EIBS eventually caused substantial loss prior to release, however CHILLS never was observed.

Ongoing investigations of CHILLS will include further electron microscopy of tissues, cell culture assays in untested cell lines and transmission studies. Cooperators include John Morrison and Jim Winton of the U.S. Fish and Wildlife Service.

Erythrocytic Inclusion Body Syndrome (EIBS)

Beginning in 1988 BPA provided funding for WDF to investigate the presence of viral particles in association with cytoplasmic inclusion bodies observed in blood films. WDF in cooperation with Charlie Smith, Beth MacConnell and Andy Blixt analyzed blood samples with electron microscopy for the presence of viral particles. Juvenile salmonids at WDF Columbia Basin hatcheries were sampled when they had a high prevalence of intracytoplasmic inclusions present in their blood. This generally coincided with an occurrence of Coldwater disease and/or fungal infection.

When EIBS was diagnosed at a high prevalence blood was collected (by Kathy Hopper, WDF) for electron microscopy. The sampling, fixing procedure was developed by Beth MacConnell, Andy Blixt and Kathy Hopper. Suspect fish were sacrificed in a MS222 solution, the caudal peduncle was severed and the fish bled into a hematocrit tube. Two blood films were made per fish, and when time permitted wet mounts were examined and hematocrits were run. The remainder of the blood was collected from the fish with hematocrit tubes and dispensed into a microcentrifuge tube. The tubes were then spun in a high speed centrifuge (13,000 x g) for five minutes to pellet the red blood cells. The serum was removed and 2.5% glutaraldehyde fixative was added for 30 minutes. The pellet was then teased away from the edge of the centrifuge tube to allow the fixative to penetrate throughout the pellet. The glutaraldehyde was then removed and fresh fixative applied and left on for 24 hours. The glutaraldehyde was removed and Milong's phosphate buffer pH 7.2 was added to store the sample. Samples were transported to the lab on freezer packs and stored refrigerated until shipment to Beth MacConnell at the Fish Technology Center, Bozeman, Montana. Samples were then transported to Andy Blixt, MSU Veterinary Research Lab and processed and selected for transmission electron microscopy.

Electron micrographs were then provided to C. Smith and WDF for evaluation. Blood films collected at the hatcheries were fixed and then stained with Leishman-Giemsa. One was provided to Charlie Smith to compare to the corresponding electron micrographs.

In 1988 samples were collected from Lewis River hatchery late coho, Grays River hatchery coho, Klickitat hatchery spring chinook, and Lyons Ferry fall chinook. The Lyons Ferry fall Chinook also had CHILLS.

Preliminary results of the Lewis River coho and Grays River coho showed that viral particles can be associated with the light staining cytoplasmic inclusions seen with light microscopy. Erythrocytes contained from one to six viral inclusions, generally only one per erythrocyte was observed. Evaluation of electron micrographs will be continued and a report on the findings will be published in 1989, authored by C. Smith and WDF personnel.

SUMMARY AND CONCLUSIONS

With the completion of another full year of sampling and data collection we are continuing to see benefits from this project. Monthly monitoring exams allow for a closer surveillance of the health condition of juveniles throughout the rearing cycle. Pre-release and midterm screening of juveniles informs Agency personnel of the condition at release, and hopefully may give indications to future contributions. Adult monitoring and testing has allowed us to give additional attention to the cause of pre-spawning mortality and better prevention and treatment of adult causes of mortality. Pathogen screening of adults will allow us to make correlations to pathogen prevalence in progeny. Computerization of fish health and hatchery rearing data has provided WDF with a tracking procedure to better understand fish health problems.

Evaluation of project goals can only occur when additional data are available over the next two years. Beginning in 1989 replicate data will be available and we will then be able to determine trends in fish disease problems and hopefully identify their solutions. Continued support of this project will allow WDF to maintain the standards and the high level of evaluation necessary to determine an accurate picture of fish health concerns.

Acknowledgments

Fish Pathologists: Tami Black, Mark Decew, Kathy Hopper.
Laboratory staff: Jennifer Hulett, John Carlson, and Jeff Grimm.
Computer Specialists: Bob Foster and Tony Rasch.
Hatchery Operations Manager: Lew Atkins.
Hatchery Managers: Paul Peterson, Dick Aksamit, Ed Jouper, Dan Bozarth, Ron Castaneda, Bob Ready, John Norton, Don Peterson, Robin Nicolay, Steve Decker, Carl Ross, Paul Petersen, Frank Anderson, Don Rapelje, Dick Johnson, Jerry Moore.

Literature Cited

Amos, K.H., editor, 1985. Procedures for the Detection and Identification of Certain Fish Pathogens. 3d edition. Fish Health Section, American Fisheries Society. Corvalis, Oregon.

Leek, S.L. 1987. Viral erythrocytic inclusion body syndrome (EIBS) occurring in juvenile spring chinook salmon (Oncorhynchus tshawvtscha) reared in freshwater. Can. J. Fish. Aquat. Sci. 44:685-688.

Michak, P.S., R. W. Rogers, 1989. Augmented Fish Health Monitoring. Annual Report 1987. U.S. Department of Energy, Bonneville Power Administration, Portland, Oregon.

Parisot, T.J., W.T. Yasutake and G.W. Klontz. 1965. Virus diseases of the Salmonidae in western United States. I. Etiology and epizootiology. Annals New York Acad. Sci. 126(1):502-519.

Piacentini, S.C., V. Lorz and J.S. Rohovec. 1989. American Fisheries Society Oregon Chapter Annual Meeting and Symposium. Bend, Oregon.

Wood, J.W. 1968. Disease of Pacific salmon. Their prevention and treatment. Washington Department of Fisheries.

Appendix A. Coelomic (Ovarian) Fluid Testing Protocol for Bacterial Kidney Disease.

Sampling Protocol

1. Collect a cupful of eggs-fluid from a spawning female.
2. Remove approximately 1 (one) ml of ovarian fluid. (We use a disposable plastic transfer pipet)

   NOTE: If viral samples will be collected in pooled lots take BKD samples first to prevent cross contamination.
3. Dispense the 1 ml of coelomic fluid into micro-centrifuge tubes.
4. Transport to lab for processing.

Lab Processing Protocol

1. Samples may be frozen for storage when immediate processing is not possible.
2. Thaw samples if frozen.
3. Load centrifuge, spin for 5 (five) minutes at a minimum of 10,000 x g to pellet cellular material.
4. Decant supernatant from centrifuge tube.
5. Using a disposable inoculating loop or CalgiSwab (dampened in Phosphate Buffered Saline [PBS]) smear a thin film of the pelleted material on a FA spot slide. A light amount of material adheres best to the slide.
6. Air dry.
7. Heat fix.
8. Methanol fix 5 (five) minutes.
9. Slides can now be stored or continue on.
10. Place a drop of FITC conjugated anti - R. salmoninarum immunoglobulin* on each well of the spot slide. (*Obtained from U.S. Fish and Wildlife Service National Fish Health Research Laboratory, Kearneysville, West Virginia, USA) Diluted 1:80 v/v in PBS pH 7.4, and filtered weekly through a 0.2 um Acrodisc nuclepore polycarbonate filter.
11. Incubate 1 hour in dark humid container to prevent drying of the conjugate.
12. Rinse slides in FTA (Fluorescent Treponemal Antibody) hemagglutination buffer - dip slides repeatedly. Soaking can cause tissue to slough off.
    NOTE: Change solutions weekly or more frequently when processing a large number of slides.
13. Counterstain with Evans Blue .0l% concentration for 3-5 minutes.
14. Rinse in second container of FTA - dip slides repeatedly.
15. Air dry in dark and/or quick dry with hair dryer.
16. Store in dark until ready to read. If it will be days before slides are read storing in the refrigerator seems to prolong life of FITC dye.
17. Cover slip - mounted with DIFCO FA mounting fluid pH 9.
18. Slides are examined under oil at 600x for 30 fields with epifluorescence illumination. Suspect bacteria are confirmed at 1000x. Characteristics required are apple-green fluorescence, small size, and halo fluorescence.
19. Bacteria per 30 fields are counted for each sample and recorded as follows: <10 bacteria per 30 fields, >lO but <100, >lOO but < 1000, >1000 and TNTC (too numerous to count).

APPENDIX B

Appendix B contains the protocol for screening selected fish populations for Mvxobolus cerebralis at WDF's Columbia River facilities. Lot selection for sampling was based on species suseptibility and duration of exposure to a surface water source. Chinook destined for yearling release were sampled either in August-September of the first year of rearing or at release (if prior rearing was in ground water. Subyearling chinook were sampled as near to release as possible. The sampling protocol for 1988 remained unchanged from the previous year. The lab processing protocol, however, was changed from the plankton centrifuge method to the pepsin-trypsin digest method.

SAMPLING PROTOCOL

(1) Sixty (60) fish are sub-sampled from an original sample of approximately 100 fish. All sub-sampled fish are subjected to a lethal concentration of MS-222,

(2) Each head is severed immediately posterior to the operculum,

(3) The lower jaw is removed,

(4) The remainder of the head is sectioned into two equal halves (sagittal section),

(5) One half of each head is placed in a plastic bag and frozen for later digest processing. Twenty (20) of the remaining heads are placed in Bouins solution and saved for histological examination, if needed.

LAB PROCESSING PROTOCOL

Except for the modifications listed below, samples are processed by the Pepsin-Trypsin Digest method in accordance with Amos, 1985 (AFS Fish Health Blue Book).

Step 2d--Centrifuge digest at 1200 X g for 10 minutes at 22 degrees C.

Step 2e--For previously frozen heads use 0.05% trypsin in Rinaldini's solution; for fresh heads use 0.25% trypsin in Rinaldini's solution.

Step 2f--Deleted.

Step 2g--Resuspend pellet in 10% neutral buffered formalin.

Step 2i--Resuspend pellet in l-2mls of neutral buffered formalin.

APPENDIX C

Appendix C contains the Disease Prevalence Summary Report for calendar year 1988. Pathogens and causes of loss are categorized by: Bacterial, Other, Parasite and Viral. Loss to each pathogen or cause is totaled per month with Lower Columbia (LCol) and Upper Columbia (UCol) stations divided.

Abbreviations:
BHS - Bacterial Hemorrhagic Septicemia
EIBS - Erythrocytic Inclusion Body Syndrome
IHNV - Infectious Hematopoietic Necrosis Virus

Location: Cowlitz

SPECIES	STOCK	BROOD	* DATE * MTH	YEAR	POUNDS OF FISH ON HAND	AVERAGE SIZE FISH/LB	POND VOLUME CU FEET	WATER INFLOW GPM	LBS PER GPM	FLOW INDEX	DENSITY INDEX	FOOD CONV	MONTHLY MORTLTY
Fall	Cowlitz	87	Feb	1988	9925	800.	133000	17600	0.56	-0-	-0-	0.	18800
Fall	Cowlitz	87	Mar	1988	21804	354.	144000	18000	1.21	-0-	-0-	1.1	30200
Fall	Cowlitz	87	Apr	1988	47026	164.	144000	18000	2.61	-0-	-0-	1.2	6300
Fall	Cowlitz	87	May	1988	96196	80.	208000	26000	3.7	1.2	0.15	1.1	16700
Fall	Cowlitz	87	Jun	1988	16071	59.	96000	12000	1.34	0.4	0.05	0.	10239
Fall	Cowlitz	87	Jul	1988	21981	43.	96000	12000	1.83	0.5	0.06	2.7	5800
Fall	Cowlitz	87	Aug	1988	44557	21.	96000	12000	3.71	0.8	0.1	1.1	7600
Fall	Cowlitz	87	Sep	1988	62233	15.	96000	12000	5.19	0.9	0.12	1.6	2200
Fall	Cowlitz	87	Oct	1988	62233	15.	96000	12000	5.19	-0-	-0-	0.	0
Fall	Cowlitz	A	Dec	1988	-0-	-0-	-0-	-0-	-0-	-0-	-0-	0.	832
Late	Cowlitz	86	Jan	1988	163021	32.	166000	20000	8.15	1.4	0.17	E2	5808
Late	Cowlitz	86	Feb	1988	179231	29.	166000	20000	8.96	2.	0.24	2.4	14465
Late	Cowlitz	86	Mar	1988	207208	25.	166000	20000	10.4	2.2	0.27	1.7	17500
Late	Cowlitz	86	Apr	1988	258255	20.	166000	20000	12.9	2.5	0.3	1.4	15100
Late	Cowlitz	86	May	1988	72121	14.	166000	20000	3.61	0.6	0.08	0.	4200
Late	Cowlitz	86	Jun	1988	55794	18.	32000	4000	13.9	2.3	0.29	-1	5400
Late	Cowlitz	87	Mar	1988	6716	849.	43000	10400	0.65	-0-	-0-	0.	3600
Late	Cowlitz	87	Apr	1988	17173	399.	43000	10400	1.65	-0-	-0-	0.	21800
Late	Cowlitz	87	May	1988	36713	175.	144000	20800	1.77	0.4	0.05	0.8	48900
Late	Cowlitz	87	Jun	1988	56159	110.	163000	20800	2.7	0.	0.12	1.2	24969
Late	Cowlitz	87	Jul	1988	68940	82.	179000	22800	3.02	0.	0.12	2.5	37500
Late	Cowlitz	87	Aug	1988	85616	65.	179000	22800	3.76	1.1	0.14	2.5	35200
Late	Cowlitz	87	Sep	1988	98602	50.	179000	22800	4.32	1.2	0.15	0.	6500
Late	Cowlitz	87	Oct	1988	104834	47.	179000	22800	4.6	-0-	-0-	5.9	2900
Late	Cowlitz	87	Nov	1988	114520	43.	179000	22800	5.02	1.3	0.17	4.1	2800
Late	Cowlitz	87	Dec	1988	148730	33.	179000	22800	6.52	1.5	0.2	1.3	16300
Late	Cowlitz	A	Jan	1988	-0-	-0-	-0-	-0-	-0-	-0-	-0-	0.	162
Late	Cowlitz	A	Dec	1988	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-	1772
Spring	Cowlitz	86	Jan	1988	46384	13.	149000	18000	2.58	0.6	0.07	E0	2037
Spring	Cowlitz	86	Feb	1988	60210	10.	149000	18000	3.35	0.5	0.06	1.1	1475
Spring	Cowlitz	86	Mar	1988	74762	8.	149000	18000	4.15	0.6	0.07	1.6	3100
Spring	Cowlitz	86	Apr	1988	85257	7.	149000	18000	4.74	0.7	0.08	0.6	1300
Spring	Cowlitz	87	Feb	1988	17832	194.	100000	9000	1.98	-0-	-0-	0.	12932
Spring	Cowlitz	87	Mar	1988	17808	194.	100000	9000	1.98	-0-	-0-	E2	4077
Spring	Cowlitz	87	Apr	1988	43629	79.	100000	9000	4.85	-0-	-0-	0.7	7105
Spring	Cowlitz	87	May	1988	10406	65.	144000	18000	0.58	0.1	0.02	0.	39645
Spring	Cowlitz	87	Jun	1988	15583	43.	144000	18000	0.87	0.2	0.03	1.1	5217
Spring	Cowlitz	87	Jul	1988	18563	36.	144000	18000	1.03	0.3	0.03	2.1	18802
Spring	Cowlitz	87	Aug	1988	20151	33.	144000	18000	1.12	0.3	0.03	5.1	3300
Spring	Cowlitz	87	Sep	1988	27545	24.	144000	18000	1.53	0.3	0.04	1.2	3900
Spring	Cowlitz	87	Oct	1988	31380	21.	144000	18000	1.74	-0-	-0-	2.3	2100
Spring	Cowlitz	87	Nov	1988	41006	16.	144000	18000	2.28	0.4	0.05	1.1	2900
Spring	Cowlitz	87	Dec	1988	46550	14.	144000	18000	2.59	0.5	0.06	2.4	4400
Spring	Cowlitz	E88	Dec	1988	-0-	-0-	-0-	-0-	-0-	-0-	-0-	0.	866000
Spring	Cowlitz	88	Dec	1988	6394	577.	57000	3800	1.68	1.	0.07	-0-	11000
Spring	Cowlitz	A	Dec	1988	-0-	-0-	-0-	-0-	-0-	-0-	-0-	0.	899

Location: Elokomin

SPECIES	STOCK	BROOD	* DATE * MTH	YEAR	POUNDS OF FISH ON HAND	AVERAGE SIZE FISH/LB	POND VOLUME CU FEET	WATER INFLOW GPM	LBS PER GPM	FLOW INDEX	DENSITY INDEX	FOOD CONV	MONTHLY MORTLTY
Early	Elokomin	A	Dec	1988	-0-	-0-	22000	4400	-0-	-0-	-0-	-0-	962
Early	Grays River	87	May	1988	3771	157.	36000	2700	1.4	0.6	0.04	0.	1570
Early	Grays River	87	Jun	1988	5140	115.	36000	2700	1.9	0.7	0.05	1.3	726
Early	Grays River	87	Jul	1988	7564	78.	36000	2700	2.8	0.9	0.07	0.8	1215
Early	Grays River	87	Aug	1988	9925	59.	36000	2300	4.32	1.2	0.08	1.3	4966
Early	Grays River	87	Sep	1988	14241	41.	36000	2300	6.19	1.7	0.11	0.7	1880
Early	Grays River	87	Oct	1988	15339	38.	36000	2300	6.67	1.7	0.11	2.7	721
Early	Grays River	87	Nov	1988	6759	32.	14000	1080	6.26	1.5	0.11	0.	0
Early	Grays River	87	Dec	1988	7193	30.	18000	1350	5.33	1.2	0.09	2.	200
Fall	Elokomin	87	Jan	1988	4154	880.	25000	1750	2.37	1.7	0.12	0.	36325
Fall	Elokomin	87	Feb	1988	7224	627.	32000	2700	2.68	1.6	0.13	0.	25496
Fall	Elokomin	87	Mar	1988	16721	276.	44500	6300	2.65	1.3	0.19	0.	4700
Fall	Elokomin	87	Apr	1988	29000	156.	44500	6300	4.6	2.2	0.31	1.	1402
Fall	Elokomin	87	May	1988	55489	74.	41000	6000	9.25	2.9	0.42	0.9	2766
Fall	Elokomin	87	Jun	1988	57819	71.	90000	6000	9.64	2.9	0.2	1.9	900
Fall	Elokomin	88	Dec	1988	4903	1013.	36000	2700	1.82	1.8	0.14	-0-	1000
Fall	Elokomin	A	Oct	1988	-0-	-0-	22000	4700	-0-	-0-	-0-	-0-	1070
Fall	Washougal	87	Mar	1988	607	688.	3599	300	2.02	1.3	0.1	0.	390
Late	Cowlitz	87	Mar	1988	706	916.	7199	600	1.18	0.7	0.06	-0-	760
Late	Cowlitz	87	Apr	1988	1396	463.	7199	600	2.33	1.3	0.1	1.1	831
Late	Elokomin	86	Jan	1988	50770	34.	149000	13350	3.8	0.9	0.08	1.9	531
Late	Elokomin	86	Feb	1988	52253	33.	136000	10276	5.08	1.1	0.09	3.6	1822
Late	Elokomin	86	Mar	1988	85050	20.	136000	11500	7.4	1.5	0.13	0.4	3200
Late	Elokomin	86	Apr	1988	86030	20.	78199	11500	7.48	1.5	0.23	0.	638
Late	Elokomin	87	Mar	1988	1702	752.	14000	1200	1.42	0.9	0.08	-0-	970
Late	Elokomin	87	Apr	1988	3689	347.	21600	1800	2.05	1.	0.09	0.	1048
Late	Elokomin	87	May	1988	9732	197.	100000	5700	1.71	0.7	0.04	0.	9717
Late	Elokomin	87	Jun	1988	17605	102.	149000	10700	1.65	0.6	0.04	0.	8518
Late	Elokomin	87	Jul	1988	24583	74.	149000	10270	2.39	0.8	0.05	0.	1034
Late	Elokomin	87	Aug	1988	31901	57.	149000	9400	3.39	0.	0.06	1.7	600
Late	Elokomin	87	Sep	1988	42251	43.	149000	8300	5.09	1.4	0.08	1.2	757
Late	Elokomin	87	Oct	1988	47773	38.	149000	7800	6.12	1.5	0.08	2.1	1225
Late	Elokomin	87	Nov	1988	56693	32.	149000	8700	6.52	1.5	0.09	0.	1245
Late	Elokomin	87	Dec	1988	60366	30.	135000	9500	6.35	1.5	0.1	2.	1638
Late	Elokomin	A	Dec	1988	-0-	-0-	22000	4400	-0-	-0-	-0-	-0-	299
Late	Kalama Falls	87	Apr	1988	647	518.	3599	300	2.16	1.2	0.1	0.	2349
Late	Kalama Falls	87	May	1988	1372	244.	7199	540	2.54	1.1	0.08	0.	2996

WDF PROGRAM QC02

Hatchery Rearing Parameters and Mortality Summary Report

July 14, 1989

Location: Grays River

SPECIES	STOCK	BROOD	* DATE * MTH	YEAR	POUNDS OF FISH ON HAND	AVERAGE SIZE FISH/LB	POND VOLUME CU FEET	WATER INFLOW GPM	LBS PER GPM	FLOW INDEX	DENSITY INDEX	FOOD CONV	MONTHLY MORTLTY
Early	Big Creek	a7	Nov	1988	11816	31.	65000	1700	6.95	1.6	0.04	-0-	300
Early	Big Creek	87	Dec	1988	12365	29.	60000	1400	8.83	2.	0.05	2.8	200
Early	Grays River	86	Jan	1988	16870	27.	72000	2300	7.33	1.6	0.05	0.	400
Early	Grays River	86	Feb	1988	19791	23.	72000	2300	8.6	1.8	0.06	1.3	300
Early	Grays River	86	Mar	1988	30320	15.	71000	2300	13.2	2.4	0.08	0.6	490
Early	Grays River	86	Apr	1988	32464	14.	71000	2300	14.1	2.8	0.09	1.3	290
Early	Grays River	87	Feb	1988	760	962.	10500	600	1.27	0.8	0.05	0.	1400
Early	Grays River	a7	Mar	1988	1279	508.	16000	900	1.42	0.8	0.05	0.	4050
Early	Grays River	a7	Apr	1988	2744	229.	16000	900	3.05	1.3	0.08	0.7	18230
Early	Grays River	a7	May	1988	2984	199.	16000	900	3.32	1.4	0.08	2.7	5670
Early	Grays River	88	Dec	1988	376	1143.	5300	300	1.25	0.	0.05	-0-	4
Early	Grays River	E88	Dec	1988	-0-	-0-	-0-	-0-	-0-	-0-	-O-	-0-	401000
Early	Grays River	A	Dec	1988	-0-	-0-	11000	1000	-0-	-0-	-o-	-0-	462
Fall	Big Creek	a7	Mar	1988	6717	366.	37000	2100	3.2	1.5	0.08	0.	5200
Fall	Big Creek	a7	Apr	1988	778	160.	5300	300	2.59	1.	0.06	0.	270
Fall	Elokomin	88	Dec	1988	2597	888.	21000	1200	2.16	1.6	0.09	-0-	5700
Fall	Elokomin	E88	Dec	1988	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-	627000
Fall	Grays River	87	Jan	1988	1451	936.	21000	1200	1.21	0.8	0.05	0.	28700
Fall	Grays River	a7	Feb	1988	3086	603.	21000	1200	2.57	1.5	0.08	0.	6350
Fall	Grays River	87	Mar	1988	3172	361.	32000	1800	1.76	0.9	0.05	0.	3300
Fall	Grays River	a7	Apr	1988	7319	156.	31600	2300	3.18	1.3	0.09	0.9	3388
Fall	Grays River	a7	May	1988	8823	129.	32000	2300	3.84	1.4	0.1	0.8	701
Fall	Grays River	E88	Dec	1988	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-O-	489000
Fall	Grays River	A	Dec	1988	-0-	-0-	11000	1000	-0-	-0-	-0-	-O-	183
Fall	Kalama Falls	87	Jan	1988	1492	945.	21000	1200	1.24	0.	0.06	0.	1400
Fall	Kalama Falls	a7	Feb	1988	2910	483.	21000	1200	2.42	1.3	0.08	0.9	4700

Location: Kalama Falls

SPECIES	STOCK	BROOD	* DATE * MTH	YEAR	POUNDS OF FISH ON HAND	AVERAGE SIZE FISH/LB	POND VOLUME CU FEET	WATER INFLOW GPM	LBS PER GPM	FLOW INDEX	DENSITY INDEX	FOOD CONV	MONTHLY MORTLTY
Early	Kalama Falls	A	Nov	1988	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-	311
Fall	Kalama Falls	a7	Jan	1988	2190	1117.	29000	1800	1.22	0.9	0.05	0.	3835
Fall	Kalama Falls	a7	Feb	1988	6805	825.	53000	3300	2.06	1.3	0.08	0.	11325
Fall	Kalama Falls	a7	Mar	1988	12906	368.	48000	5600	2.3	1.1	0.13	0.	13225
Fall	Kalama Falls	a7	Apr	1988	17053	208.	67000	7600	2.24	0.9	0.1	0.	9790
Fall	Kalama Falls	87	May	1988	30273	100.	86000	8800	3.44	1.1	0.11	0.	11860
Fall	Kalama Falls	a 7	Jun	1988	47879	63.	82000	9200	5.2	1.5	0.17	0.8	7770
Fall	Kalama Falls	E88	Oct	1988	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-O-	433800
Fall	Kalama Falls	88	Dec	1988	347	1200.	5000	200	1.74	1.3	0.05	-O-	0
Fall	Kalama Falls	A	Oct	1988	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-	642
Late	Kalama Falls	86	Jan	1988	36988	26.	55000	6000	6.16	1.3	0.14	0.9	1300
Late	Kalama Falls	86	Feb	1988	45766	21.	55000	6000	7.63	1.7	0.19	0.9	610
Late	Kalama Falls	86	Mar	1988	60025	16.	55000	6000	10.	1.8	0.2	1.3	670
Late	Kalama Falls	86	Apr	1988	22053	15.	19200	2000	11.	1.9	0.2	0.	375
Late	Kalama Falls	86	May	1988	27566	12.	19200	2000	13.8	2.3	0.24	0.	15
Late	Kalama Falls	a7	Mar	1988	667	865.	4800	500	1.33	0.9	0.1	0.	215
Late	Kalama Falls	a7	Apr	1988	1338	505.	4800	500	2.68	1.5	0.16	0.	2300
Late	Kalama Falls	a7	May	1988	2705	246.	9600	1200	2.25	1.	0.13	0.9	10530
Late	Kalama Falls	a7	Jun	1988	6884	139.	38000	4800	1.43	0.5	0.07	0.	11345
Late	Kalama Falls	a7	Jul	1988	9437	101.	38000	4000	2.36	0.8	0.08	1.8	3680
Late	Kalama Falls	a7	Aug	1988	14875	64.	38000	4000	3.72	0.7	0.07	1.1	1210
Late	Kalama Falls	a7	Sep	1988	17294	55.	38000	4800	3.6	0.	0.12	3.3	860
Late	Kalama Falls	87	Oot	1988	25010	38.	38000	4400	5.68	1.4	0.16	3.2	535
Late	Kalama Falls	a7	Nov	1988	31680	30.	38000	4800	6.6	1.5	0.18	0.	525
Late	Kalama Falls	a7	Dec	1988	31653	30.	55000	6000	5.28	1.2	0.13	E2	780
Late	Kalama Falls	E88	Dec	1988	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-	55400
Late	Kalama Falls	A	Dec	1988	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-	334
Spring	Kalama Falls	86	Jan	1988	27427	11.	374000	2000	13.7	2.	0.01	1.2	3100
Spring	Kalama Falls	86	Feb	1988	31600	9.5	374000	2000	15.8	2.3	0.01	0.9	1500
Spring	Kalama Falls	87	Jan	1988	716	916.	4800	300	2.39	1.7	0.11	0.	3335
Spring	Kalama Falls	87	Feb	1988	1128	580.	4800	350	3.22	1.9	0.14	0.	1850
Spring	Kalama Falls	87	Mar	1988	1561	354.	4800	600	2.6	1.3	0.17	0.	1750
Spring	Kalama Fal Is	a7	Apr	1988	2165	255.	4800	600	3.61	1.5	0.19	1.2	715
Spring	Kalama Falls	a7	May	1988	2932	188.	9600	1300	2.26	0.9	0.12	1.6	885
Spring	Kalama Falls	87	Jun	1988	4759	115.	14000	1950	2.44	0.6	0.09	1.2	3845
Spring	Kalama Falls	a7	Jul	1988	5929	92.	14000	1950	3.04	0.9	0.13	3.	1955
Spring	Kalama Falls	a7	Aug	1988	10250	53.	19000	2200	4.66	0.8	0.1	1.1	2210
Spring	Kalama Falls	a7	Sep	1988	12882	42.	19000	2600	4.95	1.2	0.16	2.2	2250
Spring	Kalama Fal Is	E88	Oct	1988	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-	116400
Spring	Kalama Falls	88	Dec	1988	473	1200.	10000	400	1.18	0.9	0.03	-0-	525
Spring	Kalama Falls	A	Oct	1988	-0-	-0-	-0-	-O-	-O-	-0-	-0-	0.	272

Location: Klickitat

SPECIES	STOCK	BROOD	* DATE * MTH	YEAR	POUNDS OF FISH ON HAND	AVERAGE SIZE FISH/LB	POND VOLUME CU FEET	WATER INFLOW GPM	LBS PER GPM	FLOW INDEX	DENSITY INDEX	FOOD CONV	MONTHLY MORTLTY
Early	Klickitat	A	Dec	1988	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-	115
Fall	Klickitat	87	Jan	1988	154	437.	3400	200	0.77	0.4	0.02	0.	300
Fall	Klickitat	87	Feb	1988	151	437.	3400	514	0.29	-0-	-0-	E0	1400
Fall	Klickitat	87	Mar	1988	11229	358.	53000	6400	1.75	0.	0.12	0.	63200
Fall	Klickitat	87	Apr	1988	22704	179.	53000	7100	3.2	1.3	0.17	0.	4400
Fall	Klickitat	87	May	1988	31181	98.	53000	8433	3.7	1.3	0.21	0.	8037
Fall	Klickitat	87	Jun	1988	30055	84.	53000	8396	3.58	1.2	0.18	0.	17739
Fall	Priest	87	Jan	1988	1920	948.	14000	1200	1.6	-0-	-0-	0.	1800
Fall	Priest	87	Feb	1988	7288	687.	24000	2644	2.76	-0-	-0-	0.	62100
Fall	Priest	E88	Dec	1988	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-	1400000
Late	Cowlitz	86	Jan	1988	80315	19.	39599	6500	12.4	2.4	0.4	1.6	16000
Late	Cowlitz	86	Feb	1988	63152	21.	80000	9100	6.94	1.5	0.18	0.	7000
Late	Cowlitz	86	Mar	1988	63057	21.	80000	9100	6.93	1.4	0.16	E1	2000
Late	Cowlitz	86	Apr	1988	59678	19.	80000	9100	6.56	1.2	0.14	0.	1800
Late	Cowlitz	86	May	1988	27553	15.	80000	9100	3.03	0.5	0.06	0.	800
Late	Cowlitz	86	Jun	1988	11892	13.	80000	8222	1.45	0.2	0.03	0.	800
Late	Cowlitz	86	Jul	1988	11892	13.	80000	8222	1.45	0.2	0.03	0.	0
Late	Elokomin	E88	Dec	1988	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-	1498000
Late	Lewis River	87	Feb	1988	1090	1111.	13000	900	1.21	-0-	-0-	0.	1000
Late	Lewis River	87	Mar	1988	2762	587.	13699	700	3.95	-0-	-0-	0.	49000
Late	Lewis River	87	Apr	1988	3196	444.	24000	1750	1.83	-0-	-0-	0.	1800
Late	Lewis River	87	May	1988	5772	243.	24000	2045	2.82	1.3	0.11	0.	16500
Late	Lewis River	87	Jun	1988	10372	133.	31000	5385	1.93	0.7	0.13	0.9	23129
Late	Lewis River	87	Jul	1988	13349	99.	34000	5010	2.66	0.9	0.14	1.4	27914
Late	Lewis River	87	Aug	1988	15912	77.	138000	5958	2.67	0.8	0.04	1.2	3726
Late	Lewis River	87	Sep	1988	20049	61.	138000	5958	3.37	0.	0.04	1.4	2230
Late	Lewis River	87	Oct	1988	26076	47.	138000	5788	4.51	1.1	0.05	0.	2018
Late	Lewis River	87	Nov	1988	31376	39.	132000	5800	5.41	1.3	0.06	1.8	1389
Late	Lewis River	87	Dec	1988	36029	34.	94000	4700	7.67	1.8	0.09	0.	1113
Spring	Klickitat	86	Jan	1988	67855	9.	82000	4200	16.2	2.5	0.13	0.6	800
Spring	Klickitat	86	Feb	1988	60970	10.	82000	4324	14.1	2.3	0.12	-1	1000
Spring	Klickitat	86	Mar	1988	67522	9.	82000	4324	15.6	2.4	0.13	1.2	2000
Spring	Klickitat	86	Apr	1988	75425	8.	82000	4324	17.4	2.7	0.14	1.9	4300
Spring	Klickitat	87	Jan	1988	3617	360.	17000	1500	2.41	1.2	0.11	0.6	5300
Spring	Klickitat	87	Feb	1988	5781	225.	17000	1605	3.6	-0-	-0-	1.	1500
Spring	Klickitat	87	Mar	1988	8634	138.	27000	2829	3.05	1.3	0.14	0.9	15400
Spring	Klickitat	87	Apr	1988	7699	143.	38000	3763	2.05	0.8	0.08	E0	36200
Spring	Klickitat	87	May	1988	15714	71.	99000	3541	4.44	1.6	0.06	0.	5685
Spring	Klickitat	87	Jun	1988	10286	69.	82000	2206	4.66	1.4	0.04	0.	3000
Spring	Klickitat	87	Jul	1988	16857	42.	82000	2500	6.74	1.8	0.05	0.5	1800
Spring	Klickitat	87	Aug	1988	18589	38.	82000	3364	5.53	1.4	0.06	3.	1550
Spring	Klickitat	87	Sep	1988	28224	25.	82000	6000	4.7	1.	0.07	0.6	825
Spring	Klickitat	87	Oct	1988	37105	19.	82000	6000	6.18	1.1	0.08	0.7	620
Spring	Klickitat	87	Nov	1988	41441	17.	82000	6000	6.91	1.2	0.09	1.2	390
Spring	Klickitat	87	Dec	1988	46940	15.	82000	6000	7.82	1.4	0.1	0.8	310

WDF PROGRAM QC02

Hatchery Rearing Parameters and Mortality Summary Report

July 14, 1989

Location: Klickitat

SPECIES	STOCK	BROOD	* DATE * MTH	YEAR	POUNDS OF FISH ON HAND	AVERAGE SIZE FISH/LB	POND VOLUME CU FEET	WATER INFLOW GPM	LBS PER GPM	FLOW INDEX	DENSITY INDEX	FOOD CONV	MONTHLY MORTLTY
Spring	Klickitat	E88	Dec	1988	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-	106000
Spring	Klickitat	88	Dec	1988	3449	835.	41000	2400	1.44	1.	0.06	0.	9834
Spring	Klickitat	A	Oct	1988	-0-	-0-	12000	-0-	-0-	-0-	-0-	-0-	175

Location: Lewis River

SPECIES	STOCK	BROOD	* DATE * MTH	YEAR	POUNDS OF FISH ON HAND	AVERAGE SIZE FISH/LB	POND VOLUME CU FEET	WATER INFLOW GPM	LBS PER GPM	FLOW INDEX	DENSITY INDEX	FOOD CONV	MONTHLY MORTLTY
Early	Lewis River	86	Jan	1988	16638	60.	75000	7000	2.38	0.6	0.05	0.	671
Early	Lewis River	86	Feb	1988	39864	25.	75000	7000	5.69	1.2	0.12	0.3	1680
Early	Lewis River	86	Mar	1988	49745	20.	75000	7000	7.11	1.4	0.13	1.1	1658
Early	Lewis River	86	Apr	1988	55250	18.	75000	7000	7.89	1.5	0.14	1.3	398
Early	Lewis River	A	Dec	1988	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-	141
Late	Lewis River	86	Jan	1988	126454	31.	263000	21800	5.8	1.4	0.11	0.9	4224
Late	Lewis River	86	Feb	1988	144866	27.	263000	21500	6.74	1.5	0.13	1.6	8492
Late	Lewis River	86	Mar	1988	177554	22.	255000	21000	8.45	1.8	0.14	1.2	5062
Late	Lewis River	86	Apr	1988	180375	16.	255000	21000	8.59	1.6	0.13	0.	9047
Late	Lewis River	86	May	1988	204851	14.	180000	13200	15.5	2.8	0.2	1.3	18100
Late	Lewis River	87	Mar	1988	2146	1075.	24000	1500	1.43	-0-	-0-	0.	400
Late	Lewis River	87	Apr	1988	6526	757.	48000	3000	2.18	-0-	-0-	0.	4927
Late	Lewis River	87	May	1988	13432	363.	48000	7200	1.87	1.1	0.17	0.9	66000
Late	Lewis River	87	Jun	1988	23134	201.	130000	10000	2.31	1.2	0.09	1.1	45092
Late	Lewis River	87	Jul	1988	33085	134.	180000	9800	3.38	1.3	0.07	1.4	7780
Late	Lewis River	87	Aug	1988	53321	83.	180000	10000	5.33	1.7	0.1	2.6	7846
Late	Lewis River	87	Sep	1988	57287	77.	180000	10000	5.73	1.8	0.1	4.8	14676
Late	Lewis River	87	Oct	1988	63572	69.	180000	11000	5.78	1.7	0.11	2.9	24583
Late	Lewis River	87	Nov	1988	77796	56.	180000	12000	6.48	1.8	0.12	1.6	29886
Late	Lewis River	87	Dec	1988	86984	50.	180000	12000	7.25	2.	0.13	2.9	7367
Late	Lewis River	A	Dec	1988	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-	768
Spring	Lewis River	86	Jan	1988	55060	10.	79000	5200	10.6	1.7	0.11	1.1	1226
Spring	Lewis River	86	Feb	1988	54850	10.	79000	5200	10.5	1.6	0.11	E1	2152
Spring	Lewis River	86	Mar	1988	68200	8.	79000	5000	13.6	1.9	0.12	0.6	2800
Spring	Lewis River	87	Jun	1988	9854	53.	79000	3800	2.59	0.7	0.03	-0-	888
Spring	Lewis River	87	Jul	1988	15332	34.	79000	3500	4.38	1.1	0.05	0.9	1016
Spring	Lewis River	87	Aug	1988	15778	33.	79000	4100	3.85	0.9	0.05	12.	599
Spring	Lewis River	87	Sep	1988	19074	27.	79000	5100	3.74	0.9	0.06	1.9	5736
Spring	Lewis River	87	Oct	1988	31793	16.	79000	5000	6.36	1.2	0.08	0.7	7304
Spring	Lewis River	87	Nov	1988	33526	15.	79000	4100	8.18	1.5	0.08	6.	4768
Spring	Lewis River	87	Dec	1988	33366	15.	79000	4100	8.14	1.5	0.08	E1	2379

Location: Lower Kalama

SPECIES	STOCK	BROOD	* DATE * MTH	YEAR	POUNDS OF FISH ON HAND	AVERAGE SIZE FISH/LB	POND VOLUME CU FEET	WATER INFLOW GPM	LBS PER GPM	FLOW INDEX	DENSITY INDEX	FOOD CONV	MONTHLY MORTLTY
Early	Kalama Falls	86	Jan	1988	14485	41.	65000	3000	4.83	1.2	0.06	2.7	300
Early	Kalama Falls	86	Feb	1988	21190	28.	65000	3500	6.05	1.3	0.07	0.6	580
Early	Kalama Falls	86	Mar	1988	29635	20.	65000	4000	7.41	1.5	0.09	0.7	620
Early	Kalama Falls	86	Apr	1988	34829	17.	65000	4000	8.71	1.7	0.1	0.5	600
Early	Kalama Falls	87	Mar	1988	998	563.	9600	1200	0.83	0.5	0.06	-0-	662
Early	Kalama Falls	87	Apr	1988	1186	470.	96000	1200	0.99	-0-	-0-	3.4	4500
Early	Kalama Falls	87	May	1988	2213	250.	96000	1200	1.84	0.9	0.01	0.5	4440
Early	Kalama Falls	87	Jun	1988	3177	171.	96000	1200	2.65	0.9	0.01	0.3	75
Early	Kalama Falls	87	Nov	1988	10385	57.	72000	2500	4.15	1.2	0.04	-0-	700
Early	Kalama Falls	87	Dec	1988	12858	46.	50000	2000	6.43	1.7	0.07	1.	465
Early	Kalama Falls	E88	Dec	1988	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-	300000
Early	Kalama Falls	A	Dec	1988	-0-	-0-	72000	3000	-0-	-0-	-0-	-0-	47
Early	Washougal	87	Mar	1988	270	851.	4800	600	0.45	0.3	0.04	-0-	107
Early	Washougal	87	Apr	1988	514	446.	18000	600	0.86	-0-	-0-	1.3	570
Early	Washougal	87	May	1988	109	280.	48000	600	0.18	-2	E-3	0.	840
Early	Washougal	87	Jun	1988	178	171.	48000	600	0.3	-2	E-3	0.4	35
Early	Washougal	87	Nov	1988	9649	57.	72000	2500	3.86	1.2	0.04	-0-	410
Early	Washougal	87	Dec	1988	1192	46.	50000	2000	0.6	0.2	E-2	0.	155
Fall	Elokomin	E88	Dec	1988	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-	652000
Fall	Kalama Falls	87	Jan	1988	1000	1004.	9600	1200	0.83	0.6	0.07	-0-	461
Fall	Kalama Falls	87	Feb	1988	4606	760.	33599	4200	1.1	-0-	-0-	0.	6897
Fall	Kalama Falls	87	Mar	1988	5790	604.	96000	5800	0.	0.6	0.04	3.1	3686
Fall	Kalama Falls	87	Apr	1988	15410	246.	96000	5800	2.66	-0-	-0-	0.	6260
Fall	Kalama Falls	87	May	1988	5718	200.	72000	2800	2.04	0.9	0.03	0.	2980
Fall	Kalama Falls	E88	Dec	1988	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-	103000
Fall	Kalama Falls	A	Dec	1988	-0-	-0-	72000	3000	-0-	-0-	-0-	-0-	185
Spring	Kalama Falls	87	Oct	1988	13848	39.	55000	2400	5.77	1.5	0.06	-0-	900
Spring	Kalama Falls	87	Nov	1988	15428	35.	50000	2800	5.51	1.3	0.07	2.4	1000
Spring	Kalama Falls	87	Dec	1988	8879	27.	55000	2500	3.55	0.8	0.03	0.	620

Location: Lyon's Ferry

SPECIES	STOCK	BROOD	* DATE * MTH	YEAR	POUNDS OF FISH ON HAND	AVERAGE SIZE FISH/LB	POND VOLUME CU FEET	WATER INFLOW GPM	LBS PER GPM	FLOW INDEX	DENSITY INDEX	FOOD CONV	MONTHLY MORTLTY
Fall	Lyon's Ferry	86	Jan	1988	8799	14.	30000	2900	3.03	0.5	0.05	0.	578
Fall	Lyon's Ferry	86	Jan	1988	3476	14.	6000	900	3.86	0.7	0.1	0.	531
Fall	Lyon's Ferry	86	Jan	1988	7060	13.	3000	2600	2.72	0.5	0.41	0.	331
Fall	Lyon's Ferry	86	Jan	1988	12789	12.	21000	3150	4.06	0.7	0.1	0.	1467
Fall	Lyon's Ferry	86	Feb	1988	28324	10.	54000	6150	4.61	0.7	0.09	0.	2453
Fall	Lyon's Ferry	86	Feb	1988	11817	11.	33000	3350	3.53	0.6	0.06	0.	1093
Fall	Lyon's Ferry	86	Mar	1988	16115	8.	30000	3890	4.14	0.6	0.08	0.	1062
Fall	Lyon's Ferry	86	Mar	1988	45496	9.	54000	7176	6.34	0.	0.13	0.	2700
Fall	Lyon's Ferry	86	Apr	1988	34919	8.	48000	7100	4.92	0.7	0.11	0.	1188
Fall	Lyon's Ferry	86	Apr	1988	16060	8.	30000	3900	4.12	0.6	0.08	E1	458
Fall	Lyon's Ferry	87	Jan	1988	338	1082.	1200	1400	0.24	-0-	-0-	0.	554
Fall	Lyon's Ferry	87	Feb	1988	4806	656.	42000	4400	1.09	-0-	-0-	0.	24289
Fall	Lyon's Ferry	87	Mar	1988	9693	350.	50000	8376	1.16	0.6	0.1	0.	121811
Fall	Lyon's Ferry	87	Apr	1988	16228	119.	69000	7650	2.12	0.8	0.08	0.	890
Fall	Lyon's Ferry	87	Apr	1988	14411	230.	39000	13433	1.07	-0-	-0-	0.	38966
Fall	Lyon's Ferry	87	May	1988	39468	51.	72000	9540	4.14	1.2	0.15	0.	1648
Fall	Lyon's Ferry	87	May	1988	28103	112.	41000	12800	2.2	0.8	0.25	0.	39295
Fall	Lyon's Ferry	87	Jun	1988	4539	100.	12000	2503	1.81	0.6	0.13	0.	5966
Fall	Lyon's Ferry	87	Jul	1988	8391	54.	12000	3400	2.47	0.7	0.21	0.4	770
Fall	Lyon's Ferry	87	Aug	1988	9040	48.	42000	9100	0.99	0.3	0.06	5.7	1181
Fall	Lyon's Ferry	87	Sep	1988	12318	35.	42000	9100	1.35	0.3	0.07	1.1	2963
Fall	Lyon's Ferry	87	Oct	1988	14306	30.	30000	9100	1.57	0.4	0.11	1.8	1791
Fall	Lyon's Ferry	87	Nov	1988	17119	25.	42000	9100	1.88	0.4	0.09	1.4	1259
Fall	Lyon's Ferry	87	Dec	1988	18550	23.	78000	15396	1.2	0.2	0.05	1.5	645
Fall	Lyon's Ferry	A	Dec	1988	-0-	-0-	60000	6000	-0-	-0-	-0-	-0-	392
Spring	Tucannon	87	Jan	1988	462	352.	6000	500	0.92	0.5	0.04	0.9	560
Spring	Tucannon	87	Feb	1988	887	183.	6000	500	1.77	0.8	0.06	0.8	447
Spring	Tucannon	87	Mar	1988	1502	108.	6000	846	1.78	0.6	0.09	1.	126
Spring	Tucannon	87	Apr	1988	2052	79.	6000	1120	1.83	0.6	0.11	1.5	98
Spring	Tucannon	87	May	1988	2614	60.	6000	1150	2.27	0.7	0.13	0.	173
Spring	Tucannon	87	Jun	1988	3481	45.	30000	5494	0.63	0.2	0.03	1.2	194
Spring	Tucannon	87	Jul	1988	4891	32.	30000	8500	0.58	0.1	0.04	1.4	164
Spring	Tucannon	87	Aug	1988	6517	24.	30000	8500	0.77	0.2	0.05	1.3	110
Spring	Tucannon	87	Sep	1988	8228	19.	30000	8500	0.97	0.2	0.06	1.3	69
Spring	Tucannon	87	Oct	1988	9768	16.	30000	8500	1.15	0.2	0.06	1.4	52
Spring	Tucannon	E88	Dec	1988	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-	29700
Spring	Tucannon	88	Dec	1988	176	847.	6000	1300	0.14	-2	0.02	-0-	1010

Location: Priest Rapids

SPECIES	STOCK	BROOD	* DATE * MTH YEAR	POUNDS OF FISH ON HAND	AVERAGE SIZE FISH/LB	POND VOLUME CU FEET	WATER INFLOW GPM	LBS PER GPM	FLOW INDEX	DENSITY INDEX	FOOD CONV	MONTHLY MORTLTY
Fall	Priest	87	Jan 1988	4865	1000.	19000	2400	2.03	-0-	-0-	0.	10400
Fall	Priest	87	Feb 1988	12171	575.	149000	8400	1.45	-0-	-0-	0.	579900
Fall	Priest	87	Mar 1988	36273	214.	180000	18468	1.96	0.	0.1	0.	98000
Fall	Priest	87	Apr 1988	64648	120.	324000	27500	2.35	-0-	-0-	0.9	4800
Fall	Priest	87	May 1988	95670	81.	180000	27500	3.48	1.1	0.17	0.	8500
Fall	Priest	87	Jun 1988	113367	68.	180000	30000	3.78	1.1	0.19	1.5	20300
Fall	Priest	A	Dec 1988	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-	1440

Location: Ringold

SPECIES	STOCK	BROOD	* DATE * MTH	YEAR	POUNDS OF FISH ON HAND	AVERAGE SIZE FISH/LB	POND VOLUME CU FEET	WATER INFLOW GPM	LBS PER GPM	FLOW INDEX	DENSITY INDEX	FOOD CONV	MONTHLY MORTLTY
Fall	Lyon's Ferry	87	Feb	1988	2796	682.	20000	3458	0.81	0.5	0.09	-0-	72077
Fall	Lyon's Ferry	87	Mar	1988	9222	206.	19000	3794	2.43	1.	0.2	1.1	7100
Fall	Lyon's Ferry	87	Apr	1988	17045	111.	23000	5600	3.04	1.1	0.26	0.8	7902
Spring	Wind River	86	Jan	1988	105000	9.	2940000	5080	20.7	3.	E-2	2.1	10000
Spring	Wind River	86	Feb	1988	115625	8.	2940000	4200	27.5	3.9	E-2	1.6	20000
Spring	Wind River	86	Mar	1988	130714	7.	2940000	4500	29.	3.9	E-2	1.3	10000

Location: Rocky Reach

SPECIES	STOCK	BROOD	* DATE * MTH	YEAR	POUNDS OF FISH ON HAND	AVERAGE SIZE FISH/LB	POND VOLUME CU FEET	WATER INFLOW GPM	LBS PER GPM	FLOW INDEX	DENSITY INDEX	FOOD CONV	MONTHLY MORTLTY
Early	Big Creek	87	Jan	1988	441	1000.	3200	400	1.1	0.8	0.1	0.	4600
Early	Big Creek	87	Feb	1988	808	525.	3200	600	1.35	0.9	0.16	0.9	17200
Early	Big Creek	87	Mar	1988	1224	340.	6400	1400	0.87	0.5	0.1	1.3	7900
Early	Big Creek	87	Apr	1988	2025	204.	9600	2100	0.96	0.4	0.1	0.	3200
Early	Big Creek	87	May	1988	3400	120.	9600	2100	1.62	0.6	0.13	0.9	4000
Early	Big Creek	87	Jun	1988	4724	83.	35599	4000	1.18	0.4	0.04	1.1	6951
Early	Big Creek	87	Jul	1988	7209	54.	34000	4000	1.8	0.5	0.06	0.	2811
Early	Big Creek	87	Aug	1988	9230	42.	34000	4000	2.31	0.6	0.07	1.5	1664
Early	Big Creek	87	Sep	1988	12071	32.	34000	4000	3.02	0.7	0.09	1.2	1386
Early	Big Creek	87	Oct	1988	14832	26.	34000	4000	3.71	0.8	0.1	1.3	645
Early	Big Creek	87	Nov	1988	18360	21.	34000	5000	3.67	0.8	0.12	1.	71
Early	Big Creek	87	Dec	1988	21418	18.	34000	5000	4.28	0.8	0.12	1.1	39
Early	Kalama Falls	86	Jan	1988	26090	16.	34000	4000	6.52	1.3	0.15	0.8	100
Early	Kalama Falls	86	Feb	1988	27823	15.	34000	4000	6.96	1.3	0.15	1.5	100
Early	Kalama Falls	86	Mar	1988	28389	14.7	34000	4000	7.1	1.3	0.15	5.2	20
Early	Kalama Falls	86	Apr	1988	29801	14.	34000	5600	5.32	0.	0.16	3.2	100
Early	Kalama Falls	86	May	1988	32084	13.	34000	5600	5.73	0.	0.16	0.4	125
Fall	Priest	87	Jan	1988	246	851.	1600	250	0.98	0.6	0.1	0.	7000
Fall	Priest	87	Feb	1988	346	520.	1600	300	1.15	0.7	0.13	0.	29800
Fall	Priest	87	Mar	1988	573	325.	3200	700	0.82	0.4	0.09	0.	3900
Fall	Priest	87	Apr	1988	863	215.	3200	700	1.23	0.6	0.12	1.1	700
Fall	Priest	87	May	1988	1477	125.	3200	700	2.11	0.8	0.17	0.8	1000
Fall	Priest	87	Jun	1988	2214	83.	6400	1800	1.23	0.4	0.11	1.2	918
Fall	Priest	87	Jul	1988	3209	61.	13000	2800	1.15	0.3	0.07	0.	848
Fall	Priest	87	Aug	1988	4248	46.	13000	2800	1.52	0.4	0.08	1.8	332
Fall	Priest	87	Sep	1988	6094	32.	13000	2800	2.18	0.5	0.11	1.1	402
Fall	Priest	87	Oct	1988	8099	24.	13000	2800	2.89	0.6	0.13	1.4	655
Fall	Priest	87	Nov	1988	10653	18.	34000	3700	2.88	0.6	0.06	1.3	2615
Fall	Priest	87	Dec	1988	13643	14.	34000	3700	3.69	0.6	0.07	1.2	761
Fall	Wells	86	Jan	1988	19572	12.	34000	4000	4.89	0.8	0.1	0.8	572
Fall	Wells	86	Feb	1988	21341	11.	34000	4000	5.34	0.9	0.1	1.8	115
Fall	Wells	86	Mar	1988	23008	10.2	34000	4000	5.75	0.9	0.11	2.1	77
Fall	Wells	86	Apr	1988	26721	8.6	34000	5600	4.77	0.7	0.12	1.3	4880
Late	Cowlitz	E88	Dec	1988	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-	430000

Location: Speelyai

SPECIES	STOCK	BROOD	* DATE * MTH	YEAR	POUNDS OF FISH ON HAND	AVERAGE SIZE FISH/LB	POND VOLUME CU FEET	WATER INFLOW GPM	LBS PER GPM	FLOW INDEX	DENSITY INDEX	FOOD CONV	MONTHLY MORTLTY
Early	Lewis River	86	Jan	1988	5944	25.	6900	475	12.5	3.1	0.21	0.	100
Early	Lewis River	86	Feb	1988	6456	23.	6900	475	13.6	2.9	0.2	1.8	100
Early	Lewis River	86	Mar	1988	6745	22.	6900	475	14.2	-0-	-0-	3.6	100
Early	Lewis River	86	Apr	1988	7417	20.	18000	700	10.6	-0-	-0-	1.4	50
Early	Lewis River	86	May	1988	9268	16.	18000	1000	9.27	-0-	-0-	0.6	50
Early	Lewis River	86	Jun	1988	10589	14.	18000	1000	10.6	1.9	0.11	0.8	50
Early	Lewis River	86	Jul	1988	10589	14.	18000	1000	10.6	1.9	0.11	0.	0
Early	Lewis River	87	Feb	1988	1315	1076.	21000	1200	1.1	-0-	-0-	0.	500
Early	Lewis River	87	Mar	1988	2793	504.	21000	1200	2.33	-0-	-0-	0.5	7600
Early	Lewis River	87	Apr	1988	4620	314.	55000	2800	1.65	-0-	-0-	0.	10600
Early	Lewis River	87	May	1988	7288	197.	55000	3200	2.28	-0-	-0-	E0	15900
Early	Lewis River	87	Jun	1988	13502	106.	55000	3200	4.22	1.5	0.09	0.8	4600
Early	Lewis River	87	Jul	1988	16358	78.	48000	2800	5.84	1.9	0.11	0.	1200
Early	Lewis River	87	Aug	1988	22370	57.	48000	2800	7.99	2.4	0.14	1.	900
Early	Lewis River	87	Sep	1988	24041	53.	48000	3500	6.87	1.9	0.14	0.	700
Early	Lewis River	87	Oct	1988	30278	42.	48000	3500	8.65	2.2	0.16	1.1	2500
Early	Lewis River	87	Nov	1988	37335	34.	48000	3500	10.7	2.6	0.19	1.2	2300
Early	Lewis River	87	Dec	1988	40893	31.	55000	4000	10.2	2.4	0.18	1.6	1700
Early	Lewis River	E88	Dec	1988	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-	379000
Early	Lewis River	A	Dec	1988	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-	57
Spring	Kalama Falls	86	Jan	1988	12550	14.	18000	2000	6.28	1.3	0.14	1.2	100
Spring	Kalama Falls	86	Feb	1988	12542	14.	18000	2000	6.27	1.1	0.12	E2	100
Spring	Kalama Falls	86	Mar	1988	19500	9.	18000	2500	7.8	1.2	0.17	0.5	100
Spring	Kalama Falls	87	Jan	1988	285	420.	6900	400	0.71	-0-	-0-	0.	200
Spring	Lewis River	87	Jan	1988	933	319.	6900	400	2.33	-0-	-0-	0.	200
Spring	Lewis River	87	Feb	1988	1507	263.	14000	800	1.88	-0-	-0-	0.	1000
Spring	Lewis River	87	Mar	1988	1989	249.	21000	1200	1.66	-0-	-0-	0.	1100
Spring	Lewis River	87	Apr	1988	4463	55.	21000	1300	3.43	-0-	-0-	0.	1500
Spring	Lewis River	88	Dec	1988	1019	971.	21000	900	1.13	0.8	0.04	0.	3800
Spring	Lewis River	E88	Dec	1988	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-	73000
Spring	Lewis River	A	Dec	1988	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-	18

Location: Toutle

SPECIES	STOCK	BROOD	* DATE * MTH	YEAR	POUNDS OF FISH ON HAND	AVERAGE SIZE FISH/LB	POND VOLUME CU FEET	WATER INFLOW GPM	LBS PER GPM	FLOW INDEX	DENSITY INDEX	FOOD CONV	MONTHLY MORTLTY
Early	Grays River	86	Jan	1988	10989	28.	104000	4000	2.75	-0-	-0-	0.	384
Early	Grays River	86	Feb	1988	-0-	-0-	104000	4000	-0-	-0-	-0-	-0-	210
Early	Grays River	86	Mar	1988	18070	17.	104000	4000	4.52	-0-	-0-	-0-	110
Early	Grays River	86	Apr	1988	21930	14.	104000	4000	5.48	-0-	-0-	0.9	153
Fall	Grays River	87	Mar	1988	9333	250.	104000	4000	2.33	-0-	-0-	-0-	1021
Fall	Grays River	87	Apr	1988	13873	166.	104000	4000	3.47	-0-	-0-	2.2	31500
Fall	Grays River	87	May	1988	31446	73.	104000	4000	7.86	2.5	0.1	0.9	7424

Location: Tucannon

SPECIES	STOCK	BROOD	* DATE * MTH	YEAR	POUNDS OF FISH ON HAND	AVERAGE SIZE FISH/LB	POND VOLUME CU FEET	WATER INFLOW GPM	LBS PER GPM	FLOW INDEX	DENSITY INDEX	FOOD CONV	MONTHLY MORTLTY
Spring	Tucannon	86	Jan	1988	15598	10.	8000	2244	6.95	1.1	0.31	E0	476
Spring	Tucannon	86	Feb	1988	14041	11.	8000	2244	6.26	0.	0.28	-1	1536
Spring	Tucannon	86	Mar	1988	11395	10.	8000	2244	5.08	0.8	0.23	0.	498
Spring	Tucannon	86	Apr	1988	11372	10.	8000	2244	5.07	0.8	0.23	E1	228
Spring	Tucannon	87	Nov	1988	9758	16.	8000	2244	4.35	0.8	0.23	E2	153
Spring	Tucannon	87	Dec	1988	11148	14.	8000	2244	4.97	0.9	0.25	1.2	61
Spring	Tucannon	A	Dec	1988	-0-	-0-	8000	2240	-0-	-0-	-0-	-0-	29

Location: Washougal

SPECIES	STOCK	BROOD	* DATE * MTH	YEAR	POUNDS OF FISH ON HAND	AVERAGE SIZE FISH/LB	POND VOLUME CU FEET	WATER INFLOW GPM	LBS PER GPM	FLOW INDEX	DENSITY INDEX	FOOD CONV	MONTHLY MORTLTY
Early	Kalama Falls	87	Jun	1988	4094	148.	20000	640	6.4	2.6	0.08	-0-	1089
Early	Kalama Falls	87	Jul	1988	4612	131.	26500	905	5.1	1.9	0.07	3.5	1857
Early	Kalama Falls	87	Aug	1988	7062	85.	27000	905	7.8	2.6	0.09	1.2	2106
Early	Kalama Falls	87	Sep	1988	8492	70.	27000	905	9.38	2.9	0.1	2.1	3146
Early	Kalama Falls	87	Oct	1988	9520	62.	26000	905	10.5	3.1	0.11	2.8	3329
Early	Washougal	86	Jan	1988	95069	33.	49000	8500	11.2	2.7	0.47	0.	500
Early	Washougal	E88	Dec	1988	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-	41000
Early	Washougal	A	Dec	1988	-0-	-0-	-0-	6000	-0-	-0-	-0-	0.	80
Fall	Priest	E88	Dec	1988	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-	338000
Fall	Washougal	87	Feb	1988	6754	950.	78000	2250	3.	-0-	-0-	-0-	20667
Fall	Washougal	87	Mar	1988	14631	427.	290000	9000	1.63	-0-	-0-	0.8	12700
Fall	Washougal	87	Apr	1988	27495	226.	618000	15480	1.78	0.8	0.02	0.9	8700
Fall	Washougal	87	May	1988	47890	128.	459000	9280	5.16	1.9	0.04	1.2	2847
Fall	Washougal	87	Jun	1988	80489	76.	459000	9280	8.67	2.7	0.05	0.5	1377
Fall	Washougal	87	Jul	1988	9673	52.	39000	1680	5.76	1.6	0.07	0.	840
Fall	Washougal	E88	Dec	1988	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-	612000
Fall	Washougal	A	Dec	1988	-0-	-0-	-0-	6000	-0-	-0-	-0-	0.	414
Late	Cowlitz	87	May	1988	7267	242.	43000	1490	4.88	-0-	-0-	0.	16693
Late	Cowlitz	87	Jun	1988	10456	165.	73000	2480	4.22	1.7	0.06	1.4	22991
Late	Cowlitz	87	Jul	1988	12832	134.	96000	3300	3.89	1.5	0.05	2.5	3450
Late	Cowlitz	87	Aug	1988	20354	84.	96000	3300	6.17	2.1	0.07	1.3	6754
Late	Cowlitz	87	Sep	1988	23505	71.	480000	8420	2.79	0.9	0.02	2.9	5566
Late	Cowlitz	87	Oct	1988	31228	52.	250000	4000	7.81	2.2	0.04	1.5	626
Late	Washougal	86	Feb	1988	120419	26.	490000	10000	12.	2.7	0.06	-0-	500
Late	Washougal	86	Mar	1988	142022	22.	490000	10000	14.2	3.	0.06	2.	2600
Late	Washougal	86	Apr	1988	26931	19.	70000	2250	12.	2.3	0.08	0.	800
Late	Washougal	86	May	1988	30000	17.	70000	2170	13.8	2.6	0.08	1.3	775
Late	Washougal	87	Mar	1988	4226	854.	56500	1880	2.25	-0-	-0-	-0-	6500
Late	Washougal	87	Apr	1988	8479	449.	56500	1880	4.51	-0-	-0-	0.	16000
Late	Washougal	87	May	1988	6897	262.	46000	1740	3.96	-0-	-0-	0.	37562
Late	Washougal	87	Jun	1988	11068	161.	66000	2400	4.61	2.	0.07	1.1	17422
Late	Washougal	87	Jul	1988	13876	128.	86000	3135	4.43	1.7	0.06	2.2	3557
Late	Washougal	87	Aug	1988	21565	82.	86000	3135	6.88	2.3	0.08	1.3	5234
Late	Washougal	87	Sep	1988	25232	68.	460000	7780	3.24	1.	0.02	2.7	6652
Late	Washougal	87	Oct	1988	32705	53.	200000	4800	6.81	2.	0.05	0.	1249
Late	Washougal	87	Nov	1988	76726	42.	490000	9240	8.3	2.2	0.04	0.	128
Late	Washougal	87	Dec	1988	97393	33.	490000	9240	10.5	2.6	0.05	1.4	31
Late	Washougal	A	Dec	1988	-0-	-0-	-0-	6000	-0-	-0-	-0-	0.	75

Location: Wells Spawning

SPECIES	STOCK	BROOD	* DATE * MTH YEAR	POUNDS OF FISH ON HAND	AVERAGE SIZE FISH/LB	POND VOLUME CU FEET	WATER INFLOW GPM	LBS PER GPM	FLOW INDEX	DENSITY INDEX	FOOD CONV	MONTHLY MORTLTY
Spring	Leavenworth	87	Jan 1988	1375	86.	1799	449	3.06	1.	0.26	1.	63
Spring	Leavenworth	87	Feb 1988	1936	61.	4099	898	2.16	0.6	0.14	1.8	167
Spring	Leavenworth	87	Mar 1988	2671	41.	4099	898	2.97	0.7	0.15	1.5	189
Spring	Leavenworth	87	Apr 1988	3281	36.	4099	898	3.65	-0-	-0-	0.	7
Spring	Leavenworth	88	Nov 1988	203	600.	2000	450	0.45	0.4	0.09	-0-	1034
Spring	Leavenworth	88	Dec 1988	1008	180.	4000	900	1.12	0.7	0.15	0.	497
Summer	Wells	86	Jan 1988	38727	10.	38000	2514	15.4	2.5	0.17	0.9	599
Summer	Wells	86	Feb 1988	38672	10.	38000	2514	15.4	2.4	0.16	E1	549
Summer	Wells	86	Mar 1988	38609	10.	38000	2514	15.4	2.3	0.16	E1	656
Summer	Wells	86	Apr 1988	48151	8.	38000	2514	19.2	2.8	0.18	0.4	879
Summer	Wells	87	Jan 1988	3773	591.	14000	2694	1.4	0.6	0.11	0.	26285
Summer	Wells	87	Feb 1988	7346	301.	23000	3592	2.05	0.9	0.14	0.	19135
Summer	Wells	87	Mar 1988	14603	151.	30799	4266	3.42	1.3	0.18	1.1	5923
Summer	Wells	87	Apr 1988	30597	72.	30799	5253	5.82	2.5	0.42	0.8	2302
Summer	Wells	87	May 1988	9974	64.	20000	2020	4.94	1.3	0.14	0.	2025
Summer	Wells	87	Jun 1988	15152	42.	20000	1544	9.81	1.4	0.11	0.7	2165
Summer	Wells	87	Jul 1988	13273	33.	38000	4725	2.81	0.6	0.08	0.	516
Summer	Wells	87	Aug 1988	16828	26.	38000	4725	3.56	0.8	0.1	1.6	503
Summer	Wells	87	Sep 1988	27325	16.	38000	4725	5.78	1.1	0.14	0.7	328
Summer	Wells	87	Oct 1988	28910	15.	38000	4725	6.12	1.1	0.14	4.3	3548
Summer	Wells	87	Nov 1988	33300	13.	38000	4725	7.05	1.2	0.15	1.3	830
Summer	Wells	87	Dec 1988	33185	13.	38000	4950	6.7	1.1	0.15	E1	1491
Summer	Wells	88	Dec 1988	736	1100.	6000	900	0.82	0.7	0.1	0.	8275
Summer	Wells	E88	Dec 1988	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-	262895
Summer	Wells	A	Oct 1988	-0-	-0-	25000	2021	-0-	-0-	-0-	-0-	68

APPENDIX D

Appendix D contains the Hatchery Rearing Parameters and Mortality Summary Report. Data are presented by location, sorted by species, stock and brood. Data are from January 1, 1988 to December 31, 1988.

Abbreviations:
Brood = A - adults returning in 1988.
Brood = E88 - eggs taken in 1988.

WDF PROGRAM QC01
DISEASE PREVALENCE SUMMARY
July 17, 1989

Disease Category: Bacterial
Agent: Bacterial Gill Dis

Basin	Location	Species	Stock	Brood	Size Fish/Lb	Flow Index	Density Index	Number Loss	% Loss
UCol									
Month: February	1988								
	Lyon's Ferry	Fall Chinook	Lyon's Ferry	87	656.	-0-	-0-	55	E-3
	Lyon's Ferry	Spring Chinook	Tucannon	87	183.	0.751	0.0626	17	0.01
	Tucannon	Spring Chinook	Tucannon	86	11.	0.	0.2804	711	0.46
								783	
Month: March	1988								
	Lyon's Ferry	Fall Chinook	Lyon's Ferry	87	350.	0.576	0.0966	80173	2.36
								80173	
Month: April	1988								
	Lyon's Ferry	Fall Chinook	Lyon's Ferry	87	230.	-0-	-0-	28503	0.86
								28503	
Month: May	1988								
	Lyon's Ferry	Fall Chinook	Lyon's Ferry	87	51.	1.168	0.1547	12889	0.64
	Lyon's Ferry	Fall Chinook	Lyon's Ferry	87	112.	0.785	0.2452	12889	0.41
								25778	

Disease Category: Bacterial
Agent: BHS

Basin	Location	Species	Stock	Brood	Size Fish/Lb	Flow Index	Density Index	Number Loss	% Loss
LCol									
Month: January	1988								
	Elokomin	Fall Chinook	Elokomin	87	880.	1.675	0.1172	11625	0.32
	Lewis River	Spring Chinook	Lewis River	86	10.	1.681	0.1106	858	0.16
								12483	
Month: February	1988								
	Cowlitz	Spring Chinook	Cowlitz	86	10.	0.531	0.0641	148	0.02
	Lewis River	Spring Chinook	Lewis River	86	10.	1.644	0.1082	710	0.13
								858	
Month: March	1988								
	Lewis River	Spring Chinook	Lewis River	86	8.	1.946	0.1232	191	0.04
								191	
Month: April	1988								
	Lower Kalama	Fall Chinook	Kalama Falls	87	246.	-0-	-0-	2740	0.07
								2740	
Month: December	1988								
	Cowlitz	Spring Chinook	Cowlitz	A	-0-	-0-	-0-	90	0.99
								90	

Disease Category: Bacterial
Agent: Bacterial Kidney Dis

Basin	Location	Species	Stock	Brood	Size Fish/Lb	Flow Index	Density Index	Number Loss	% Loss
LCol									
Month: March	1988								
	Cowlitz	Late Coho	Cowlitz	86	25.	2.249	0.271	8750	0.17
	Cowlitz	Spring Chinook	Cowlitz	86	8.	0.593	0.0716	806	0.13
	Grays River	Early Coho	Grays River	86	15.	2.426	0.0786	6	E-3
								9562	
Month: April	1988								
	Cowlitz	Late Coho	Cowlitz	86	20.	2.485	0.2994	755	0.01
								755	
Month: June	1988								
	Cowlitz	Spring Chinook	Cowlitz	87	43.	0.234	0.0292	1304	0.19
								1304	
Month: September	1988								
	Lewis River	Spring Chinook	Lewis River	87	27.	0.872	0.0563	28	E-2
								28	
Month: October	1988								
	Kalama Falls	Spring Chinook	Kalama Falls	A	-0-	-0-	-0-	11	1.18
								11	
Month: December	1988								
	Cowlitz	Spring Chinook	Cowlitz	A	-0-	-0-	-0-	90	0.99
								90	
UCol									
Month: January	1988								
	Klickitat	Late Coho	Cowlitz	86	19.	2.433	0.3993	13440	0.88
	Klickitat	Spring Chinook	Klickitat	86	9.	2.487	0.1274	480	0.08
	Lyon's Ferry	Fall Chinook	Lyon's Ferry	86	14.	0.691	0.1036	395	0.81
	Lyon's Ferry	Fall Chinook	Lyon's Ferry	86	12.	0.692	0.1038	1166	0.76
	Lyon's Ferry	Fall Chinook	Lyon's Ferry	86	13.	0.472	0.4094	61	0.07
	Lyon's Ferry	Fall Chinook	Lyon's Ferry	86	14.	0.543	0.0525	322	0.26
								15864	
Month: February	1988								
	Klickitat	Late Coho	Cowlitz	86	21.	1.546	0.1759	3415	0.26
	Klickitat	Spring Chinook	Klickitat	86	10.	2.281	0.1203	465	0.08
	Lyon's Ferry	Fall Chinook	Lyon's Ferry	86	11.	0.589	0.0598	901	0.69
	Lyon's Ferry	Fall Chinook	Lyon's Ferry	86	10.	0.75	0.0854	1942	0.69

								6723	
Month: March	1988								
	Klickitat	Late Coho	Cowlitz	86	21.	1.408	0.1602	1690	0.13
	Klickitat	Spring Chinook	Klickitat	86	9.	2.389	0.126	1560	0.26
	Klickitat	Spring Chinook	Klickitat	87	138.	1.292	0.1354	1500	0.13
	Lyon's Ferry	Fall Chinook	Lyon's Ferry	86	8.	0.608	0.0789	872	0.68
	Lyon's Ferry	Fall Chinook	Lyon's Ferry	86	9.	0.976	0.1297	1951	0.48
	Wells Spawning	Summer Chinook	Wells	86	10.	2.35	0.1555	279	0.07
	Wells Spawning	Summer Chinook	Wells	87	151.	1.279	0.1771	1743	0.08
								.....	
								9595	
Month: April	1988								
	Klickitat	Late Coho	Cowlitz	86	19.	1.243	0.1414	1500	0.13
	Klickitat	Spring Chinook	Klickitat	86	8.	2.669	0.1407	4000	0.66
	Klickitat	Spring Chinook	Klickitat	87	143.	0.776	0.0768	1500	0.14
	Lyon's Ferry	Fall Chinook	Lyon's Ferry	86	8.	0.591	0.0768	341	0.27
	Lyon's Ferry	Fall Chinook	Lyon's Ferry	86	8.	0.726	0.1074	767	0.27
	Rocky Reach	Fall Chinook	Wells	86	8.6	0.721	0.1188	4425	1.93
	Wells Spawning	Summer Chinook	Wells	86	8.	2.764	0.1829	416	0.11
	Wells Spawning	Summer Chinook	Wells	87	72.	2.466	0.4205	619	0.03
								.....	
								13568	
Month: May	1988								
	Wells Spawning	Summer Chinook	Wells	87	64.	1.349	0.1362	212	0.03
								.....	
								212	
Month: June	1988								
	Wells Spawning	Summer Chinook	Wells	87	42.	1.449	0.1119	18	E-3
								.....	
								18	
Month: July	1988								
	Wells Spawning	Summer Chinook	Wells	87	33.	0.605	0.0752	25	E-2
								.....	
								25	
Month: August	1988								
	Wells Spawning	Summer Chinook	Wells	87	26.	0.78	0.097	26	E-2
								.....	
								26	
Month: October	1988								
	Wells Spawning	Summer Chinook	Wells	A	-0-	-0-	-0-	14	1.19
								.....	
								14	
Month: December	1988								
	Lyon's Ferry	Fall Chinook	Lyon's Ferry	A	-0-	-0-	-0-	10	0.71
								.....	
								10	

Disease Category: Bacterial
Agent: Columnaris

Basin	Location	Species	Stock	Brood	Size Fish/Lb	Flow Index	Density Index	Number Loss	% Loss
LCol									
Month: August	1988								
	Washougal	Early Coho	Kalama Falls	87	85.	2.608	0.0874	1264	0.21
								1264	
UCol									
Month: July	1988								
	Rocky Reach	Early Coho	Big Creek	87	54.	0.503	0.0592	1747	0.45
								1747	
Month: August	1988								
	Rocky Reach	Early Coho	Big Creek	87	42.	0.598	0.0704	965	0.25
								965	
Month: September	1988								
	Rocky Reach	Early Coho	Big Creek	87	32.	0.73	0.0859	270	0.07
								270	
Month: October	1988								
	Rocky Reach	Early Coho	Big Creek	87	26.	0.841	0.0989	75	0.02
								75	
Month: December	1988								
	Priest Rapids	Fall Chinook	Priest Rapids	A	-0-	-0-	-0-	1224	17.4
	Tucannon	Spring Chinook	Tucannon	A	-0-	-0-	-0-	18	15.1
								1242	

Disease Category: Bacterial
Agent: Cold Water Disease

Basin	Location	Species	Stock	Brood	Size Fish/Lb	Flow Index	Density Index	Number Loss	% Loss
LCol									
Month: January	1988								
	Cowlitz	Late Coho	Cowlitz	86	32.	1.448	0.1744	4646	0.09
	Cowlitz	Spring Chinook	Cowlitz	86	13.	0.55	0.0664	407	0.07
	Grays River	Early Coho	Grays River	86	27.	1.634	0.0522	50	0.01
	Lewis River	Early Coho	Lewis River	86	60.	0.554	0.0517	470	0.05
	Lewis River	Late Coho	Lewis River	86	31.	1.364	0.1131	2534	0.06
								8107	
Month: February	1988								
	Cowlitz	Late Coho	Cowlitz	86	29.	2.032	0.2449	11572	0.22
	Lewis River	Early Coho	Lewis River	86	25.	1.247	0.1164	333	0.03
	Lewis River	Late Coho	Lewis River	86	27.	1.542	0.126	5310	0.14
								17215	
Month: March	1988								
	Cowlitz	Spring Chinook	Cowlitz	86	8.	0.593	0.0716	1643	0.27
	Grays River	Early Coho	Grays River	86	15.	2.426	0.0786	47	0.01
	Grays River	Early Coho	Grays River	87	508.	0.802	0.0451	450	0.07
	Lewis River	Early Coho	Lewis River	86	20.	1.421	0.1327	318	0.03
	Lewis River	Late Coho	Lewis River	86	22.	1.76	0.145	3349	0.09
	Lewis River	Spring Chinook	Lewis River	86	8.	1.946	0.1232	1366	0.25
	Speelyai	Early Coho	Lewis River	87	504.	-0-	-0-	7600	0.54
								14773	
Month: April	1988								
	Cowlitz	Late Coho	Cowlitz	86	20.	2.485	0.2994	5285	0.1
	Cowlitz	Late Coho	Cowlitz	87	399.	-0-	-0-	5450	0.08
	Elokomin	Late Coho	Kalama Falls	87	518.	1.218	0.1015	2194	0.65
	Grays River	Early Coho	Grays River	87	229.	1.335	0.0751	17085	2.72
	Grays River	Fall Chinook	Grays River	87	156.	1.263	0.0919	30	E-3
	Lewis River	Early Coho	Lewis River	86	18.	1.53	0.1428	319	0.03
	Lewis River	Late Coho	Lewis River	86	16.	1.616	0.1331	7796	0.27
	Lewis River	Late Coho	Lewis River	87	757.	-0-	-0-	3111	0.06
	Lower Kalama	Early Coho	Kalama Falls	87	470.	-0-	-0-	2820	0.51
	Speelyai	Early Coho	Lewis River	87	314.	-0-	-0-	7000	0.48
	Washougal	Late Coho	Washougal	87	449.	-0-	-0-	12800	0.34
								63890	
Month: May	1988								
	Cowlitz	Late Coho	Cowlitz	87	175.	0.353	0.051	24450	0.38
	Elokomin	Late Coho	Elokomin	87	197.	0.723	0.0412	6917	0.36
	Elokomin	Late Coho	Kalama Falls	87	244.	1.133	0.085	2659	0.79
	Grays River	Early Coho	Grays River	87	199.	1.428	0.0803	4375	0.74
	Kalama Falls	Late Coho	Kalama Falls	87	246.	1.005	0.1256	6695	1.01
	Lewis River	Late Coho	Lewis River	86	14.	2.776	0.2036	17973	0.63
	Lewis River	Late Coho	Lewis River	87	363.	1.102	0.1653	58778	1.21

	Lower Kalama	Early Coho	Kalama Falls	87	250.	0.852	0.0106	3980	0.72
	Lower Kalama	Early Coho	Washougal	87	280.	0.087	0.0011	315	1.03
	Speelyai	Early Coho	Lewis River	87	197.	-0-	-0-	15105	1.05
	Washougal	Late Coho	Cowlitz	87	242.	-0-	-0-	6677	0.38
	Washougal	Late Coho	Washougal	87	262.	-0-	-0-	33055	1.83

								180979	
Month: June	1988								
	Cowlitz	Late Coho	Cowlitz	87	110.	0.952	0.1215	18727	0.3
	Elokomin	Late Coho	Elokomin	87	102.	0.573	0.0411	4745	0.26
	Kalama Falls	Late Coho	Kalama Falls	87	139.	0.544	0.0687	5700	0.6
	Lewis River	Late Coho	Lewis River	87	201.	1.152	0.0886	41379	0.89
	Washougal	Late Coho	Cowlitz	87	165.	1.7	0.0577	6897	0.4
	Washougal	Late Coho	Washougal	87	161.	1.952	0.071	10453	0.59

								87901	
Month: July	1988								
	Cowlitz	Late Coho	Cowlitz	87	82.	0.972	0.1238	22500	0.4
	Elokomin	Early Coho	Grays River	87	78.	0.936	0.0702	443	0.08
	Elokomin	Late Coho	Elokomin	87	74.	0.751	0.0517	550	0.03
	Kalama Falls	Late Coho	Kalama Falls	87	101.	0.778	0.0819	2785	0.29
	Lewis River	Late Coho	Lewis River	87	134.	1.319	0.0718	6692	0.15
	Speelyai	Early Coho	Lewis River	87	78.	1.903	0.111	300	0.02
	Washougal	Late Coho	Washougal	87	128.	1.678	0.0612	711	0.04

								33981	
Month: August	1988								
	Cowlitz	Late Coho	Cowlitz	87	65.	1.122	0.1429	8800	0.16
	Elokomin	Early Coho	Grays River	87	59.	1.246	0.0796	4701	0.8
	Lewis River	Late Coho	Lewis River	87	83.	1.714	0.0952	5563	0.13
	Speelyai	Early Coho	Lewis River	87	57.	2.387	0.1393	200	0.02

								19264	
Month: September	1988								
	Elokomin	Early Coho	Grays River	87	41.	1.728	0.1104	1724	0.3
	Lewis River	Late Coho	Lewis River	87	77.	1.796	0.0998	12424	0.28
	Lewis River	Spring Chinook	Lewis River	87	27.	0.872	0.0563	2537	0.49
	Speelyai	Early Coho	Lewis River	87	53.	1.896	0.1383	400	0.03

								17085	
Month: October	1988								
	Lewis River	Late Coho	Lewis River	87	69.	1.748	0.1068	19647	0.45
	Lewis River	Spring Chinook	Lewis River	87	16.	1.188	0.0752	3457	0.68
	Speelyai	Early Coho	Lewis River	87	42.	2.22	0.1618	1500	0.12

								24604	
Month: November	1988								
	Lewis River	Late Coho	Lewis River	87	56.	1.83	0.122	1793	0.04
	Lewis River	Spring Chinook	Lewis River	87	15.	1.494	0.0776	1172	0.23
	Speelyai	Early Coho	Lewis River	87	34.	2.58	0.1882	1300	0.1

							4265	
Month: December	1988							
	Cowlitz	Late Coho	Cowlitz	87	33. 1.549	0.1972	13000	0.26
	Grays River	Early Coho	Big Creek	87	29. 1.985	0.0463	34	E-2
	Speelyai	Early Coho	Lewis River	87	31. 2.427	0.1765	1500	0.12

							14534	
UCol								
Month: January	1988							
	Klickitat	Late Coho	Cowlitz	86	19. 2.433	0.3993	1280	0.08
	Rocky Reach	Early Coho	Big Creek	87	1000. 0.779	0.0973	3300	0.75

							4580	
Month: February	1988							
	Rocky Reach	Early Coho	Big Creek	87	525. 0.855	0.1603	14764	3.48

							14764	
Month: March	1988							
	Klickitat	Late Coho	Lewis River	87	587. -0-	-0-	26700	1.65
	Rocky Reach	Early Coho	Big Creek	87	340. 0.473	0.1034	6075	1.46
	Rocky Reach	Early Coho	Big Creek	87	340. 0.473	0.1034	6075	1.46
	Rocky Reach	Fall Chinook	Priest Rapids	87	325. 0.425	0.0929	260	0.14

							39110	
Month: April	1988							
	Klickitat	Late Coho	Lewis River	87	444. -0-	-0-	1500	0.11
	Rocky Reach	Early Coho	Big Creek	87	204. 0.437	0.0957	1600	0.39

							3100	
Month: May	1988							
	Klickitat	Late Coho	Lewis River	87	243. 1.304	0.1111	14470	1.03
	Rocky Reach	Early Coho	Big Creek	87	120. 0.596	0.1304	760	0.19

							15230	
Month: June	1988							
	Klickitat	Late Coho	Lewis River	87	133. 0.741	0.1288	16479	1.19
	Rocky Reach	Early Coho	Big Creek	87	83. 0.38	0.0427	4935	1.26

							21414	
Month: July	1988							
	Klickitat	Late Coho	Lewis River	87	99. 0.94	0.1385	24364	1.84
	Rocky Reach	Early Coho	Big Creek	87	54. 0.503	0.0592	40	0.01

							24404	
Month: August	1988							
	Klickitat	Late Coho	Lewis River	87	77. 0.838	0.0362	1574	0.13

1574

Disease Category: Bacterial
Agent: Enteric Redmouth Dis

Basin	Location	Species	Stock	Brood	Size Fish/Lb	Flow Index	Density Index	Number Loss	% Loss
LCol									
Month: February	1988								
	Cowlitz	Spring Chinook	Cowlitz	86	10.	0.531	0.0641	590	0.1
								590	
Month: April	1988								
	Cowlitz	Spring Chinook	Cowlitz	87	79.	-0-	-0-	4618	0.13
								4618	
Month: May	1988								
	Cowlitz	Spring Chinook	Cowlitz	87	65.	0.136	0.017	23787	3.52
								23787	
Month: June	1988								
	Cowlitz	Spring Chinook	Cowlitz	87	43.	0.234	0.0292	1304	0.19
	Kalama Falls	Fall Chinook	Kalama Falls	87	63.	1.519	0.1705	1560	0.05
	Kalama Falls	Spring Chinook	Kalama Falls	87	115.	0.639	0.089	1855	0.34
								4719	
Month: July	1988								
	Cowlitz	Fall Chinook	Cowlitz	87	43.	0.48	0.06	2320	0.25
								2320	
Month: August	1988								
	Cowlitz	Fall Chinook	Cowlitz	87	21.	0.773	0.0966	3040	0.32
								3040	
Month: December	1988								
	Cowlitz	Spring Chinook	Cowlitz	87	14.	0.459	0.0574	2640	0.41
								2640	
UCol									
Month: March	1988								
	Klickitat	Spring Chinook	Klickitat	87	138.	1.292	0.1354	12400	1.04
	Lyon's Ferry	Fall Chinook	Lyon's Ferry	87	350.	0.576	0.0966	7989	0.24
								20389	
Month: April	1988								
	Klickitat	Fall Chinook	Klickitat	87	179.	1.269	0.17	3800	0.09
	Klickitat	Spring Chinook	Klickitat	87	143.	0.776	0.0768	33200	3.02
	Lyon's Ferry	Fall Chinook	Lyon's Ferry	87	230.	-0-	-0-	2159	0.07

								39159	
Month: May	1988								
	Klickitat	Fall Chinook	Klickitat	87	98.	1.342	0.2135	7262	0.24
	Klickitat	Spring Chinook	Klickitat	87	71.	1.61	0.0576	4935	0.44

								12197	
Month: June	1988								
	Klickitat	Fall Chinook	Klickitat	87	84.	1.151	0.1823	17164	0.68
	Lyon's Ferry	Fall Chinook	Lyon's Ferry	87	100.	0.614	0.1281	285	0.06
	Priest Rapids	Fall Chinook	Priest Rapids	87	68.	1.143	0.1904	6000	0.08

								23449	

Disease Category: Bacterial
Agent: Furunculosis

Basin	Location	Species	Stock	Brood	Size Fish/Lb	Flow Index	Density Index	Number Loss	% Loss
LCol									
Month: May	1988								
	Lower Kalama	Fall Chinook	Kalama Falls	87	200.	0.894	0.0348	2330	0.2
								2330	
Month: August	1988								
	Kalama Falls	Spring Chinook	Kalama Falls	87	53.	0.833	0.0965	900	0.17
								900	
Month: September	1988								
	Lewis River	Spring Chinook	Lewis River	87	27.	0.872	0.0563	560	0.11
								560	
Month: October	1988								
	Kalama Falls	Fall Chinook	Kalama Falls	A	-0-	-0-	-0-	35	1.02
	Kalama Falls	Spring Chinook	Kalama Falls	A	-0-	-0-	-0-	18	1.93
	Lower Kalama	Spring Chinook	Kalama Falls	87	39.	1.466	0.064	280	0.05
	Washougal	Early Coho	Kalama Falls	87	62.	3.144	0.1094	2663	0.45
								2996	
Month: November	1988								
	Lower Kalama	Spring Chinook	Kalama Falls	87	35.	1.32	0.0739	400	0.07
								400	
Month: December	1988								
	Cowlitz	Late Coho	Cowlitz	A	-0-	-0-	-0-	797	2.58
	Cowlitz	Late Coho	Cowlitz	A	-0-	-0-	-0-	797	2.58
	Cowlitz	Spring Chinook	Cowlitz	87	14.	0.459	0.0574	1760	0.27
	Cowlitz	Spring Chinook	Cowlitz	A	-0-	-0-	-0-	450	4.96
	Washougal	Early Coho	Washougal	A	-0-	-0-	-0-	40	6.9
	Washougal	Fall Chinook	Washougal	A	-0-	-0-	-0-	207	3.96
	Washougal	Late Coho	Washougal	A	-0-	-0-	-0-	15	0.54
								4066	
UCol									
Month: December	1988								
	Lyon's Ferry	Fall Chinook	Lyon's Ferry	A	-0-	-0-	-0-	50	3.56
								50	

Disease Category: Other
Agent: blank egg

Basin	Location	Species	Stock	Brood	Size Fish/Lb	Flow Index	Density Index	Number Loss	% Loss
LCol									
Month: December	1988								
	Lower Kalama	Early Coho	Kalama Falls	88	-0-	-0-	-0-	300000	16.
	Lower Kalama	Fall Chinook	Elokomin	88	-0-	-0-	-0-	652000	35.4
	Lower Kalama	Fall Chinook	Kalama Falls	88	-0-	-0-	-0-	103000	4.4

								1055000	
UCol									
Month: December	1988								
	Klickitat	Fall Chinook	Priest Rapids	88	-0-	-0-	-0-	1050000	17.1
	Rocky Reach	Late Coho	Cowlitz	88	-0-	-0-	-0-	374000	36.7
	Wells Spawning	Summer Chinook	Wells	88	-0-	-0-	-0-	62895	1.95
	Wells Spawning	Summer Chinook	Wells	88	1100.	0.693	0.1039	62895	7.77

								1549790	

Disease Category: Other
Agent: Coho Anemia Disease

Basin	Location	Species	Stock	Brood	Size Fish/Lb	Flow Index	Density Index	Number Loss	% Loss
LCol									
Month: November	1988								
	Lewis River	Late Coho	Lewis River	87	56.	1.83	0.122	20323	0.47
								20323	
Month: December	1988								
	Lewis River	Late Coho	Lewis River	87	50.	1.98	0.132	5894	0.14
								5894	

Disease Category: Other
Agent: Chills

Basin	Location	Species	Stock	Brood	Size Fish/Lb	Flow Index	Density Index	Number Loss	% Loss
UCol									
Month: September	1988								
	Lyon's Ferry	Fall Chinook	Lyon's Ferry	87	35.	0.331	0.0716	714	0.17
								714	
Month: October	1988								
	Lyon's Ferry	Fall Chinook	Lyon's Ferry	87	30.	0.377	0.1143	95	0.02
								95	
Month: November	1988								
	Lyon's Ferry	Fall Chinook	Lyon's Ferry	87	25.	0.408	0.0885	346	0.08
								346	

Disease Category: Other
Agent: Coagulated Yolk

Basin	Location	Species	Stock	Brood	Size Fish/Lb	Flow Index	Density Index	Number Loss	% Loss
LCol									
Month: January	1988								
	Grays River	Fall Chinook	Grays River	a7	936.	0.808	0.0462	200	0.01
	Grays River	Fall Chinook	Kalama Falls	a7	945.	0.987	0.0564	100	E-2
	Lower Kalama	Fall Chinook	Kalama Falls	a7	1004.	0.588	0.0735	461	0.05
								761	
Month: February	1988								
	Cowlitz	Fall Chinook	Cowlitz	a7	800.	-0-	-0-	9400	0.12
	Grays River	Early Coho	Grays River	a7	962.	0.826	0.0472	400	0.05
	Grays River	Fall Chinook	Grays River	a7	603.	1.452	0.083	2300	0.12
	Grays River	Fall Chinook	Kalama Falls	87	483.	1.339	0.0765	1600	0.11
	Kalama Falls	Fall Chinook	Kalama Falls	87	825.	1.31	0.0815	1605	0.03
	Lower Kalama	Fall Chinook	Kalama Falls	87	760.	-0-	-0-	6897	0.2
	Speelyai	Early Coho	Lewis River	87	1076.	-0-	-0-	500	0.04
	Washougal	Fall Chinook	Washougal	a7	950.	-0-	-0-	18600	0.29
								41302	
Month: March	1988								
	Grays River	Early Coho	Grays River	87	508.	0.802	0.0451	1997	0.31
	Grays River	Fall Chinook	Grays River	87	361.	0.914	0.0514	185	0.02
	Kalama Falls	Fall Chinook	Kalama Falls	87	368.	1.126	0.1313	3270	0.07
	Lower Kalama	Fall Chinook	Kalama Falls	87	604.	0.618	0.0374	2949	0.08
								8401	
Month: April	1988								
	Lewis River	Late Coho	Lewis River	87	757.	-0-	-0-	565	0.01
								565	
Month: May	1988								
	Lewis River	Late Coho	Lewis River	87	363.	1.102	0.1653	16	E-4
								16	
Month: December	1988								
	Grays River	Fall Chinook	Elokomin	88	888.	1.571	0.0898	868	0.04
								868	
UCol									
Month: January	1988								
	Priest Rapids	Fall Chinook	Priest Rapids	87	1000.	-0-	-0-	7800	0.16
	Rocky Reach	Fall Chinook	Priest Rapids	87	851.	0.643	0.1004	5600	2.67
	Wells Spawning	Spring Chinook	Leavenworth	87	86.	1.038	0.2589'	42	0.04
	Wells Spawning	Summer Chinook	Wells	87	591.	0.593	0.1141	22785	1.02

								.....	
								36227	
Month: February	1988								
	Klickitat	Fall Chinook	Priest Rapids	87	687.	-0-	-0-	56300	1.12
	Lyon's Ferry	Fall Chinook	Lyon's Ferry	87	656.	-0-	-0-	11262	0.36
	Priest Rapids	Fall Chinook	Priest Rapids	87	575.	-0-	-0-	522000	7.46
	Ringold	Fall Chinook	Lyon's Ferry	87	682.	0.513	0.0888	72077	3.78
	Rocky Reach	Fall Chinook	Priest Rapids	87	520.	0.716	0.1342	26140	14.5
	Wells Spawning	Summer Chinook	Wells	a7	301.	0.881	0.1375	11357	0.51
								.....	
								699136	
Month: March	1988								
	Klickitat	Fall Chinook	Klickitat	a7	358.	0.969	0.117	60100	1.49
	Klickitat	Late Coho	Lewis River	87	587.	-0-	-0-	19200	1.18
	Lyon's Ferry	Fall Chinook	Lyon's Ferry	87	350.	0.576	0.0966	11719	0.35
	Priest Rapids	Fall Chinook	Priest Rapids	87	214.	0.998	0.1024	88200	1.14
	Ringold	Fall Chinook	Lyon's Ferry	87	206.	1.012	0.2021	4100	0.22
	Rocky Reach	Fall Chinook	Priest Rapids	87	325.	0.425	0.0929	1300	0.7
								.....	
								184619	
Month: November	1988								
	Wells Spawning	Spring Chinook	Leavenworth	88	600.	0.41	0.0922	386	0.32
								.....	
								386	
Month: December	1988								
	Wells Spawning	Spring Chinook	Leavenworth	88	180.	0.677	0.1524	17	E-2
	Wells Spawning	Summer Chinook	Wells	88	1100.	0.693	0.1039	3400	0.42
								.....	
								3417	

Disease Category: Other
Agent: Dropout

Basin	Location	Species	Stock	Brood	Size Fish/Lb	Flow Index	Density Index	Number Loss	% Loss
LCol									
Month: January	1988								
	Elokomin	Fall Chinook	Elokomin	87	880.	1.675	0.1172	13075	0.36
								13075	
Month: February	1988								
	Elokomin	Fall Chinook	Elokomin	87	627.	1.581	0.1334	1450	0.03
	Elokomin	Late Coho	Elokomin	86	33.	1.133	0.0856	1350	0.08
								2800	
Month: March	1988								
	Cowlitz	Spring Chinook	Cowlitz	87	194.	-0-	-0-	2030	0.06
	Grays River	Early Coho	Grays River	87	508.	0.802	0.0451	260	0.04
								2290	
UCol									
Month: January	1988								
	Wells Spawning	Spring Chinook	Leavenworth	87	86.	1.038	0.2589	18	0.02
	Wells Spawning	Summer Chinook	Wells	86	10.	2.541	0.1681	29	E-2
								47	
Month: February	1988								
	Lyon's Ferry	Spring Chinook	Tucannon	87	183.	0.751	0.0626	397	0.24
	Wells Spawning	Spring Chinook	Leavenworth	87	61.	0.645	0.1412	25	0.02
	Wells Spawning	Summer Chinook	Wells	86	10.	2.442	0.1616	103	0.03
	Wells Spawning	Summer Chinook	Wells	87	301.	0.881	0.1375	7099	0.32
								7624	
Month: March	1988								
	Lyon's Ferry	Fall Chinook	Lyon's Ferry	87	350.	0.576	0.0966	7924	0.23
	Lyon's Ferry	Spring Chinook	Tucannon	87	108.	0.635	0.0896	78	0.05
	Wells Spawning	Spring Chinook	Leavenworth	87	41.	0.675	0.1478	12	0.01
	Wells Spawning	Summer Chinook	Wells	86	10.	2.35	0.1555	207	0.05
	Wells Spawning	Summer Chinook	Wells	87	151.	1.279	0.1771	2996	0.14
								11217	
Month: April	1988								
	Lyon's Ferry	Fall Chinook	Lyon's Ferry	87	230.	-0-	-0-	6482	0.2
	Wells Spawning	Summer Chinook	Wells	86	8.	2.764	0.1829	234	0.06
	Wells Spawning	Summer Chinook	Wells	87	72.	2.466	0.4205	889	0.04
								7605	
Month: May	1988								

	Lyon's Ferry	Fall Chinook	Lyon's Ferry	87	51.	1.168	0.1547	19923	0.99
	Lyon's Ferry	Fall Chinook	Lyon's Ferry	87	112.	0.785	0.2452	19923	0.63
	Rocky Reach	Fall Chinook	Priest Rapids	87	125.	0.788	0.1725	500	0.27
	Wells Spawning	Summer Chinook	Wells	87	64.	1.349	0.1362	294	0.05

								40640	
Month: June	1988								
	Lyon's Ferry	Fall Chinook	Lyon's Ferry	87	100.	0.614	0.1281	5107	1.13
	Rocky Reach	Fall Chinook	Priest Rapids	87	83.	0.391	0.1098	422	0.23
	Wells Spawning	Summer Chinook	Wells	87	42.	1.449	0.1119	42	E-2

								5571	
Month: July	1988								
	Lyon's Ferry	Fall Chinook	Lyon's Ferry	87	54.	0.738	0.209	415	0.09
	Rocky Reach	Fall Chinook	Priest Rapids	87	61.	0.327	0.0705	56	0.03
	Wells Spawning	Summer Chinook	Wells	87	33.	0.605	0.0752	54	0.01

								525	
Month: August	1988								
	Lyon's Ferry	Fall Chinook	Lyon's Ferry	87	48.	0.266	0.0576	13	E-3
	Wells Spawning	Summer Chinook	Wells	87	26.	0.78	0.097	96	0.02

								109	
Month: September	1988								
	Wells Spawning	Summer Chinook	Wells	87	16.	1.121	0.1394	102	0.02

								102	
Month: October	1988								
	Wells Spawning	Summer Chinook	Wells	87	15.	1.118	0.139	101	0.02

								101	
Month: November	1988								
	Wells Spawning	Spring Chinook	Leavenworth	88	600.	0.41	0.0922	326	0.27
	Wells Spawning	Summer Chinook	Wells	87	13.	1.243	0.1546	74	0.02

								400	
Month: December	1988								
	Wells Spawning	Spring Chinook	Leavenworth	88	180.	0.677	0.1524	187	0.1
	Wells Spawning	Summer Chinook	Wells	87	13.	1.135	0.1479	86	0.02
	Wells Spawning	Summer Chinook	Wells	88	1100.	0.693	0.1039	3175	0.39

								3448	

Disease Category: Other
Agent: Predation

Basin	Location	Species	Stock	Brood	Size Fish/Lb	Flow Index	Density Index	Number Loss	% Loss
LCol									
Month: January	1988								
	Grays River	Early Coho	Grays River	86	27.	1.634	0.0522	250	0.05
	Kalama Falls	Spring Chinook	Kalama Falls	86	11.	2.049	0.011	3100	1.03
	Lewis River	Early Coho	Lewis River	86	60.	0.554	0.0517	201	0.02
	Lower Kalama	Early Coho	Kalama Falls	86	41.	1.239	0.0572	200	0.03
								3751	
Month: February	1988								
	Grays River	Early Coho	Grays River	86	23.	1.806	0.0577	100	0.02
	Grays River	Fall Chinook	Grays River	87	603.	1.452	0.083	50	E-3
	Kalama Falls	Spring Chinook	Kalama Falls	86	9.5	2.255	0.0121	1500	0.5
	Lewis River	Early Coho	Lewis River	86	25.	1.247	0.1164	1162	0.12
	Lewis River	Late Coho	Lewis River	86	27.	1.542	0.126	1438	0.04
	Lower Kalama	Early Coho	Kalama Falls	86	28.	1.349	0.0726	580	0.1
								4830	
Month: March	1988								
	Grays River	Early Coho	Grays River	86	15.	2.426	0.0786	11	E-3
	Lewis River	Early Coho	Lewis River	86	20.	1.421	0.1327	1275	0.13
	Lewis River	Late Coho	Lewis River	86	22.	1.76	0.145	1050	0.03
	Lower Kalama	Early Coho	Kalama Falls	86	20.	1.482	0.0912	310	0.05
	Lower Kalama	Early Coho	Kalama Falls	87	563.	0.503	0.0629	33	E-2
	Lower Kalama	Fall Chinook	Kalama Falls	87	604.	0.618	0.0374	737	0.02
								3416	
Month: April	1988								
	Grays River	Early Coho	Grays River	86	14.	2.823	0.0914	28	E-2
	Lower Kalama	Early Coho	Kalama Falls	86	17.	1.663	0.1023	360	0.06
	Lower Kalama	Fall Chinook	Kalama Falls	87	246.	-0-	-0-	1385	0.04
								1773	
Month: May	1988								
	Elokomin	Fall Chinook	Elokomin	87	74.	2.865	0.4192	1000	0.02
	Elokomin	Late Coho	Elokomin	87	197.	0.723	0.0412	680	0.04
								1680	
Month: June	1988								
	Elokomin	Early Coho	Grays River	87	115.	0.681	0.0511	47	E-2
	Elokomin	Late Coho	Elokomin	87	102.	0.573	0.0411	290	0.02
								337	
Month: December	1988								
	Elokomin	Late Coho	Elokomin	87	30.	1.481	0.1042	500	0.03

								.....	
								500	
UCol									
Month: January	1988								
	Klickitat	Late Coho	Cowlitz	86	19.	2.433	0.3993	1280	0.08
	Klickitat	Spring Chinook	Klickitat	86	9.	2.487	0.1274	320	0.05
	Ringold	Spring Chinook	Wind River	86	9.	3.035	0.0052	10000	1.06
	Rocky Reach	Early Coho	Kalama Falls	86	16.	1.255	0.1477	74	0.02
	Wells Spawning	Spring Chinook	Leavenworth	87	86.	1.038	0.2589	3	E-3
								.....	
								11677	
Month: February	1988								
	Klickitat	Fall Chinook	Klickitat	87	437.	-0-	-0-	285	0.43
	Klickitat	Fall Chinook	Priest Rapids	87	687.	-0-	-0-	5800	0.12
	Klickitat	Late Coho	Cowlitz	86	21.	1.546	0.1759	1085	0.08
	Klickitat	Spring Chinook	Klickitat	86	10.	2.281	0.1203	535	0.09
	Klickitat	Spring Chinook	Klickitat	87	225.	-0-	-0-	435	0.03
	Ringold	Spring Chinook	Wind River	86	8.	3.885	0.0055	14500	1.57
	Wells Spawning	Spring Chinook	Leavenworth	87	61.	0.645	0.1412	13	0.01
	Wells Spawning	Summer Chinook	Wells	86	10.	2.442	0.1616	76	0.02
								.....	
								22729	
Month: March	1988								
	Klickitat	Fall Chinook	Klickitat	87	358.	0.969	0.117	3100	0.08
	Klickitat	Late Coho	Cowlitz	86	21.	1.408	0.1602	310	0.02
	Klickitat	Spring Chinook	Klickitat	86	9.	2.389	0.126	440	0.07
	Ringold	Spring Chinook	Wind River	86	7.	3.904	0.006	8500	0.93
	Wells Spawning	Summer Chinook	Wells	86	10.	2.35	0.1555	72	0.02
								.....	
								12422	
Month: April	1988								
	Klickitat	Fall Chinook	Klickitat	87	179.	1.269	0.17	600	0.01
	Klickitat	Late Coho	Cowlitz	86	19.	1.243	0.1414	300	0.03
	Klickitat	Spring Chinook	Klickitat	86	8.	2.669	0.1407	300	0.05
	Rocky Reach	Early Coho	Kalama Falls	86	14.	0.972	0.1602	20	E-3
	Wells Spawning	Summer Chinook	Wells	86	8.	2.764	0.1829	66	0.02
	Wells Spawning	Summer Chinook	Wells	87	72.	2.466	0.4205	48	E-3
								.....	
								1334	
Month: May	1988								
	Wells Spawning	Summer Chinook	Wells	87	64.	1.349	0.1362	21	E-3
								.....	
								21	
Month: June	1988								
	Klickitat	Spring Chinook	Klickitat	87	69.	1.427	0.0384	2250	0.32
	Priest Rapids	Fall Chinook	Priest Rapids	87	68.	1.143	0.1904	1300	0.02
	Wells Spawning	Summer Chinook	Wells	87	42.	1.449	0.1119	11	E-3
								.....	
								3561	

Month: July	1988								
	Klickitat	Spring Chinook	Klickitat	87	42.	1.803	0.055	925	0.13
	Wells Spawning	Summer Chinook	Wells	87	33.	0.605	0.0752	33	E-2

								958	
Month: August	1988								
	Klickitat	Spring Chinook	Klickitat	87	38.	1.39	0.057	930	0.13
	Wells Spawning	Summer Chinook	Wells	87	26.	0.78	0.097	56	0.01

								986	
Month: September	1988								
	Klickitat	Spring Chinook	Klickitat	87	25.	1.021	0.0747	525	0.07
	Wells Spawning	Summer Chinook	Wells	87	16.	1.121	0.1394	8	E-3

								533	
Month: October	1988								
	Klickitat	Late Coho	Lewis River	87	47.	1.144	0.048	512	0.04
	Klickitat	Spring Chinook	Klickitat	87	19.	1.106	0.0809	465	0.07

								977	
Month: November	1988								
	Klickitat	Late Coho	Lewis River	87	39.	1.296	0.057	504	0.04
	Klickitat	Spring Chinook	Klickitat	87	17.	1.177	0.0862	250	0.04

								754	
Month: December	1988								
	Klickitat	Late Coho	Lewis River	87	34.	1.837	0.0918	380	0.03
	Klickitat	Spring Chinook	Klickitat	87	15.	1.43	0.1046	155	0.02

								535	

Disease Category: Other
Agent: Envir. Gill Disease

Basin	Location	Species	Stock	Brood	Size Fish/Lb	Flow Index	Density Index	Number Loss	% Loss
UCol									
Month: February	1988								
	Ringold	Spring Chinook	Wind River	86	8.	3.885	0.0055	5500	0.59

								5500	
Month: March	1988								
	Ringold	Spring Chinook	Wind River	86	7.	3.904	0.006	1500	0.16

								1500	

Disease Category: Other
Agent: Eye picking

Basin	Location	Species	Stock	Brood	Size Fish/Lb	Flow Index	Density Index	Number Loss	% Loss
LCol									
Month: March	1988								
	Grays River	Early Coho	Grays River	86	15.	2.426	0.0786	22	E-3
								22	
Month: April	1988								
	Grays River	Early Coho	Grays River	86	14.	2.823	0.0914	6	E-3
								6	
Month: May	1988								
	Grays River	Early Coho	Grays River	87	199.	1.428	0.0803	580	0.1
								580	
UCol									
Month: March	1988								
	Wells Spawning	Summer Chinook	Wells	86	10.	2.35	0.1555	43	0.01
								43	
Month: April	1988								
	Wells Spawning	Summer Chinook	Wells	86	8.	2.764	0.1829	86	0.02
	Wells Spawning	Summer Chinook	Wells	87	72.	2.466	0.4205	222	0.01
								308	
Month: May	1988								
	Rocky Reach	Early Coho	Big Creek	87	120.	0.596	0.1304	2400	0.59
	Wells Spawning	Summer Chinook	Wells	87	64.	1.349	0.1362	125	0.02
								2525	
Month: June	1988								
	Lyon's Ferry	Fall Chinook	Lyon's Ferry	87	100.	0.614	0.1281	22	E-3
	Rocky Reach	Early Coho	Big Creek	87	83.	0.38	0.0427	1220	0.31
	Wells Spawning	Summer Chinook	Wells	87	42.	1.449	0.1119	60	E-2
								1302	
Month: July	1988								
	Lyon's Ferry	Fall Chinook	Lyon's Ferry	87	54.	0.738	0.209	123	0.03
	Lyon's Ferry	Spring Chinook	Tucannon	87	32.	0.135	0.0383	16	0.01
	Wells Spawning	Summer Chinook	Wells	87	33.	0.605	0.0752	100	0.02
								239	
Month: August	1988								
	Lyon's Ferry	Fall Chinook	Lyon's Ferry	87	48.	0.266	0.0576	306	0.07

	Lyon's Ferry	Spring Chinook	Tucannon	87	24.	0.162	0.046	23	0.01
	Wells Spawning	Summer Chinook	Wells	87	26.	0.78	0.097	158	0.04

								487	
Month: September	1988								
	Lyon's Ferry	Fall Chinook	Lyon's Ferry	87	35.	0.331	0.0716	298	0.07
	Lyon's Ferry	Spring Chinook	Tucannon	87	19.	0.205	0.0581	18	0.01
	Rocky Reach	Fall Chinook	Priest Rapids	87	32.	0.507	0.1093	189	0.1
	Wells Spawning	Summer Chinook	Wells	87	16.	1.121	0.1394	176	0.04

								681	
Month: October	1988								
	Lyon's Ferry	Fall Chinook	Lyon's Ferry	87	30.	0.377	0.1143	207	0.05
	Rocky Reach	Fall Chinook	Priest Rapids	87	24.	0.617	0.133	83	0.04
	Wells Spawning	Summer Chinook	Wells	87	15.	1.118	0.139	132	0.03

								422	
Month: November	1988								
	Lyon's Ferry	Fall Chinook	Lyon's Ferry	87	25.	0.408	0.0885	180	0.04
	Wells Spawning	Summer Chinook	Wells	87	13.	1.243	0.1546	136	0.03

								316	
Month: December	1988								
	Lyon's Ferry	Fall Chinook	Lyon's Ferry	87	23.	0.249	0.0491	150	0.04
	Wells Spawning	Summer Chinook	Wells	87	13.	1.135	0.1479	136	0.03

								286	

Disease Category: Other
Agent: Saprolegnia

Basin	Location	Species	Stock	Brood	Size Fish/Lb	Flow Index	Density Index	Number Loss	% Loss
LCol									
Month: January	1988								
	Kalama Falls	Late Coho	Kalama Falls	86	26.	1.316	0.1435	50	E-2
								50	
Month: February	1988								
	Kalama Falls	Fall Chinook	Kalama Falls	87	825.	1.31	0.0815	460	E-2
	Kalama Falls	Late Coho	Kalama Falls	86	21.	1.745	0.1904	80	E-2
	Kalama Falls	Spring Chinook	Kalama Falls	87	580.	1.862	0.1358	245	0.04
	Lewis River	Late Coho	Lewis River	86	27.	1.542	0.126	150	E-3
								935	
Month: March	1988								
	Kalama Falls	Fall Chinook	Kalama Falls	87	368.	1.126	0.1313	2435	0.05
	Kalama Falls	Late Coho	Kalama Falls	86	16.	1.789	0.1952	310	0.03
	Kalama Falls	Spring Chinook	Kalama Falls	87	354.	1.322	0.1653	175	0.03
								2920	
Month: April	1988								
	Kalama Falls	Fall Chinook	Kalama Falls	87	208.	0.864	0.098	3705	0.1
	Kalama Falls	Late Coho	Kalama Falls	86	15.	1.918	0.1998	100	0.03
	Kalama Falls	Spring Chinook	Kalama Falls	87	255.	1.528	0.191	175	0.03
								3980	
Month: May	1988								
	Kalama Falls	Fall Chinook	Kalama Falls	87	100.	1.066	0.109	2060	0.07
	Kalama Falls	Late Coho	Kalama Falls	87	246.	1.005	0.1256	3300	0.5
	Kalama Falls	Spring Chinook	Kalama Falls	87	188.	0.868	0.1176	105	0.02
								5465	
Month: June	1988								
	Kalama Falls	Fall Chinook	Kalama Falls	87	63.	1.519	0.1705	735	0.02
	Kalama Falls	Late Coho	Kalama Falls	87	139.	0.544	0.0687	100	0.01
	Kalama Falls	Spring Chinook	Kalama Falls	87	115.	0.639	0.089	150	0.03
								985	
Month: July	1988								
	Kalama Falls	Late Coho	Kalama Falls	87	101.	0.778	0.0819	50	E-2
	Kalama Falls	Spring Chinook	Kalama Falls	87	92.	0.919	0.1281	515	0.09
								565	
Month: August	1988								
	Kalama Falls	Late Coho	Kalama Falls	87	64.	0.656	0.069	260	0.03
	Kalama Falls	Spring Chinook	Kalama Falls	87	53.	0.833	0.0965	355	0.07

									615	
Month: September	1988									
	Kalama Falls	Late Coho	Kalama Falls	87		55.	0.963	0.1217	180	0.02
	Kalama Falls	Spring Chinook	Kalama Falls	87		42.	1.155	0.158	500	0.09

									680	
Month: October	1988									
	Kalama Falls	Fall Chinook	Kalama Falls	A	-O-		-o-	-0-	525	15.3
	Kalama Falls	Late Coho	Kalama Falls	87		38.	1.362	0.1577	110	0.01
	Kalama Falls	Spring Chinook	Kalama Falls	A	-0-		-0-	-0-	131	14.1

									766	
Month: November	1988									
	Kalama Falls	Late Coho	Kalama Falls	87		30.	1.458	0.1841	5	E-3

									5	
Month: December	1988									
	Cowlitz	Late Coho	Cowlitz	A	-O-		-O-	-0-	886	2.87
	Cowlitz	Late Coho	Cowlitz	A	-O-		-o-	-0-	886	2.87
	Cowlitz	Spring Chinook	Cowlitz	A	-O-		-O-	-0-	225	2.48
	Grays River	Early Coho	Grays River	88		1143.	0.965	0.0546	201000	46.8
	Grays River	Early Coho	Grays River	88	-0-		-0-	-0-	201000	7.47
	Grays River	Fall Chinook	Elokomin	88		888.	1.571	0.0898	327000	14.2
	Grays River	Fall Chinook	Elokomin	88	-0-		-0-	-0-	327000	10.3
	Grays River	Fall Chinook	Grays River	88	-0-		-0-	-0-	200000	5.96
	Kalama Falls	Late Coho	Kalama Falls	87		30.	1.155	0.126	240	0.03
	Lewis River	Early Coho	Lewis River	A	-0-		-0-	-0-	141	4.41
	Lewis River	Early Coho	Lewis River	A	-0-		-0-	-0-	141	4.41
	Lewis River	Late Coho	Lewis River	A	-0-		-0-	-0-	768	2.77
	Lewis River	Late Coho	Lewis River	A	-0-		-0-	-0-	768	2.77

									1260055	
UCol										
Month: January	1988									
	Rocky Reach	Fall Chinook	Wells	86		12.	0.829	0.0975	499	0.21
	Wells Spawning	Summer Chinook	Wells	86		10.	2.541	0.1681	97	0.03

									596	
Month: February	1988									
	Wells Spawning	Summer Chinook	Wells	86		10.	2.442	0.1616	71	0.02

									71	
Month: October	1988									
	Wells Spawning	Summer Chinook	Wells	A	-o-		-O-	-0-	4	0.34

									4	
Month: November	1988									

	Wells Spawning	Summer Chinook	Wells	87		13.	1.243	0.1546	342	0.08

									342	
Month: December	1988									
	Priest Rapids	Fall Chinook	Priest Rapids	A	-0-		-0-	-0-	72	1.03
	Rocky Reach	Fall Chinook	Priest Rapids	87		14.	0.646	0.0703	487	0.25
	Tucannon	Spring Chinook	Tucannon	A	-0-		-0-	-0-	6	5.04
	Wells Spawning	Summer Chinook	Wells	87		13.	1.135	0.1479	259	0.06

									824	

Disease Category: Other
Agent: Handling mortality

Basin	Location	Species	Stock	Brood	Size Fish/Lb	Flow Index	Density Index	Number Loss	% Loss
LCol									
Month: January	1988								
	Kalama Falls	Fall Chinook	Kalama Falls	87	1117.	0.858	0.0533	2705	0.11
	Kalama Falls	Late Coho	Kalama Falls	86	26.	1.316	0.1435	1000	0.1
	Kalama Falls	Spring Chinook	Kalama Falls	87	916.	1.686	0.1054	1655	0.25
								5360	
Month: February	1988								
	Grays River	Early Coho	Grays River	87	962.	0.826	0.0472	200	0.03
								200	
Month: March	1988								
	Grays River	Fall Chinook	Big Creek	87	366.	1.451	0.0824	60	E-3
	Grays River	Fall Chinook	Grays River	87	361.	0.914	0.0514	450	0.04
								510	
Month: April	1988								
	Grays River	Fall Chinook	Big Creek	87	160.	1.014	0.0574	119	0.1
	Speelyai	Early Coho	Lewis River	87	314.	-0-	-0-	3600	0.25
								3719	
Month: May	1988								
	Elokomin	Early Coho	Grays River	87	157.	0.554	0.0416	413	0.07
	Elokomin	Late Coho	Elokomin	87	197.	0.723	0.0412	179	E-2
	Grays River	Early Coho	Grays River	87	199.	1.428	0.0803	300	0.05
								892	
Month: June	1988								
	Elokomin	Late Coho	Elokomin	87	102.	0.573	0.0411	2000	0.11
	Kalama Falls	Late Coho	Kalama Falls	87	139.	0.544	0.0687	1360	0.14
								3360	
Month: July	1988								
	Elokomin	Late Coho	Elokomin	87	74.	0.751	0.0517	400	0.02
								400	
Month: August	1988								
	Kalama Falls	Spring Chinook	Kalama Falls	87	53.	0.833	0.0965	200	0.04
								200	
Month: November	1988								
	Grays River	Early Coho	Big Creek	87	31.	1.62	0.0424	251	0.07
	Lower Kalama	Early Coho	Kalama Falls	87	57.	1.16	0.0403	120	0.02

								371	
Month: December	1988								
	Elokomin	Fall Chinook	Elokomin	88	1013.	1.845	0.1384	600	0.01
	Elokomin	Late Coho	Elokomin	87	30.	1.481	0.1042	500	0.03
	Grays River	Early Coho	Big Creek	87	29.	1.985	0.0463	14	E-3
	Grays River	Fall Chinook	Elokomin	88	888.	1.571	0.0898	415	0.02
	Kalama Falls	Late Coho	Kalama Falls	87	30.	1.155	0.126	70	E-2
	Kalama Falls	Spring Chinook	Kalama Falls	88	1200.	0.858	0.0343	525	0.09
	Washougal	Fall Chinook	Priest Rapids	88	-0-	-0-	-0-	338000	21.2

								340124	
UCol									
Month: January	1988								
	Klickitat	Fall Chinook	Klickitat	87	437.	0.419	0.0246	300	0.44
	Klickitat	Fall Chinook	Priest Rapids	87	948.	-0-	-0-	1800	0.1
	Klickitat	Spring Chinook	Klickitat	87	360.	1.225	0.1081	5300	0.41
	Lyon's Ferry	Fall Chinook	Lyon's Ferry	86	13.	0.472	0.4094	189	0.21
	Lyon's Ferry	Fall Chinook	Lyon's Ferry	86	14.	0.543	0.0525	152	0.12

								7741	
Month: February	1988								
	Klickitat	Late Coho	Cowlitz	86	21.	1.546	0.1759	2500	0.19
	Lyon's Ferry	Fall Chinook	Lyon's Ferry	86	10.	0.75	0.0854	168	0.06
	Lyon's Ferry	Fall Chinook	Lyon's Ferry	87	656.	-0-	-0-	3538	0.11
	Wells Spawning	Spring Chinook	Leavenworth	87	61.	0.645	0.1412	17	0.01
	Wells Spawning	Summer Chinook	Wells	87	301.	0.881	0.1375	530	0.02

								6753	
Month: March	1988								
	Rocky Reach	Early Coho	Big Creek	87	340.	0.473	0.1034	100	0.02
	Rocky Reach	Early Coho	Big Creek	87	340.	0.473	0.1034	100	0.02
	Rocky Reach	Fall Chinook	Priest Rapids	87	325.	0.425	0.0929	30	0.02
	Wells Spawning	Summer Chinook	Wells	87	151.	1.279	0.1771	944	0.04

								1174	
Month: April	1988								
	Lyon's Ferry	Fall Chinook	Lyon's Ferry	87	119.	0.759	0.0841	890	0.05
	Lyon's Ferry	Fall Chinook	Lyon's Ferry	87	230.	-0-	-0-	1138	0.03
	Wells Spawning	Summer Chinook	Wells	87	72.	2.466	0.4205	103	E-3

								2131	
Month: May	1988								
	Lyon's Ferry	Fall Chinook	Lyon's Ferry	87	51.	1.168	0.1547	2514	0.12
	Lyon's Ferry	Fall Chinook	Lyon's Ferry	87	112.	0.785	0.2452	2514	0.08
	Rocky Reach	Early Coho	Kalama Falls	86	13.	0.983	0.162	100	0.02
	Wells Spawning	Summer Chinook	Wells	87	64.	1.349	0.1362	1317	0.21

								6445	

Month: June	1988								
	Lyon's Ferry	Fall Chinook	Lyon's Ferry	87	100.	0.614	0.1281	533	0.12
	Lyon's Ferry	Spring Chinook	Tucannon	87	45.	0.164	0.0301	81	0.05
	Rocky Reach	Fall Chinook	Priest Rapids	87	83.	0.391	0.1098	30	0.02

								644	
Month: July	1988								
	Klickitat	Late Coho	Lewis River	87	99.	0.94	0.1385	450	0.03
	Rocky Reach	Fall Chinook	Priest Rapids	87	61.	0.327	0.0705	166	0.08

								616	
Month: August	1988								
	Lyon's Ferry	Fall Chinook	Lyon's Ferry	87	48.	0.266	0.0576	518	0.12
	Wells Spawning	Summer Chinook	Wells	87	26.	0.78	0.097	72	0.02

								590	
Month: September	1988								
	Lyon's Ferry	Fall Chinook	Lyon's Ferry	87	35.	0.331	0.0716	87	0.02

								87	
Month: October	1988								
	Wells Spawning	Summer Chinook	Wells	A	-0-	-0-	-0-	29	2.47

								29	
Month: November	1988								
	Rocky Reach	Fall Chinook	Priest Rapids	87	18.	0.567	0.0617	2000	1.04
	Tucannon	Spring Chinook	Tucannon	87	16.	0.812	0.2278	84	0.05
	Wells Spawning	Spring Chinook	Leavenworth	88	600.	0.41	0.0922	137	0.11

								2221	
Month: December	1988								
	Lyon's Ferry	Fall Chinook	Lyon's Ferry	87	23.	0.249	0.0491	220	0.05
	Lyon's Ferry	Fall Chinook	Lyon's Ferry	A	-0-	-0-	-0-	50	3.56
	Priest Rapids	Fall Chinook	Priest Rapids	A	-0-	-0-	-0-	144	2.05
	Wells Spawning	Spring Chinook	Leavenworth	88	180.	0.677	0.1524	115	0.06
	Wells Spawning	Summer Chinook	Wells	88	1100.	0.693	0.1039	1700	0.21

								2229	

Disease Category: Other
Agent: Jumpouts

Basin	Location	Species	Stock	Brood	Size Fish/Lb	Flow Index	Density Index	Number Loss	% Loss
LCol									
Month: January	1988								
	Elokomin	Late Coho	Elokomin	86	34.	0.938	0.084	100	E-2
								100	
UCol									
Month: January	1988								
	Lyon's Ferry	Fall Chinook	Lyon's Ferry	86	12.	0.692	0.1038	16	0.01
								16	
Month: February	1988								
	Lyon's Ferry	Fall Chinook	Lyon's Ferry	86	10.	0.75	0.0854	21	E-2
	Wells Spawning	Spring Chinook	Leavenworth	87	61.	0.645	0.1412	112	0.09
								133	
Month: March	1988								
	Lyon's Ferry	Fall Chinook	Lyon's Ferry	86	9.	0.976	0.1297	252	0.06
	Wells Spawning	Spring Chinook	Leavenworth	87	41.	0.675	0.1478	44	0.04
								296	
Month: April	1988								
	Lyon's Ferry	Fall Chinook	Lyon's Ferry	86	8.	0.726	0.1074	55	0.02
	Wells Spawning	Spring Chinook	Leavenworth	87	36.	-0-	-0-	5	E-3
	Wells Spawning	Summer Chinook	Wells	87	72.	2.466	0.4205	50	E-3
								110	
Month: July	1988								
	Rocky Reach	Fall Chinook	Priest Rapids	87	61.	0.327	0.0705	46	0.02
								46	

Disease Category: Other
Agent: Fish Kill

Basin	Location	Species	Stock	Brood	Size Fish/Lb	Flow Index	Density Index	Number Loss	% Loss
UCol									
Month: December	1988								
	Lyon's Ferry	Fall Chinook	Lyon's Ferry	A	-0-	-0-	-0-	261	18.6
								261	

Disease Category: Other
Agent: Precocious males

Basin	Location	Species	Stock	Brood	Size Fish/Lb	Flow Index	Density Index	Number Loss	% Loss
LCol									
Month: December	1988								
	Lewis River	Spring Chinook	Lewis River	87	15.	1.487	0.0772	435	0.09

								435	
UCol									
Month: December	1988								
	Wells Spawning	Summer Chinook	Wells	87	13.	1.135	0.1479	916	0.21

								916	

Disease Category: Other
Agent: Marking mortality

Basin	Location	Species	Stock	Brood	Size Fish/Lb	Flow Index	Density Index	Number Loss	% Loss
UCol									
Month: March	1988								
	Wells Spawning	Spring Chinook	Leavenworth	87	41.	0.675	0.1478	133	0.12
	Wells Spawning	Summer Chinook	Wells	87	151.	1.279	0.1771	240	0.01
								373	
Month: April	1988								
	Wells Spawning	Spring Chinook	Leavenworth	87	36.	-0-	-0-	2	E-3
	Wells Spawning	Summer Chinook	Wells	87	72.	2.466	0.4205	371	0.02
								373	
Month: May	1988								
	Wells Spawning	Summer Chinook	Wells	87	64.	1.349	0.1362	56	E-2
								56	
Month: June	1988								
	Priest Rapids	Fall Chinook	Priest Rapids	87	68.	1.143	0.1904	500	E-2
								500	

Disease Category: Other
Agent: Normal

Basin	Location	Species	Stock	Brood	Size Fish/Lb	Flow Index	Density Index	Number Loss	% Loss
LCol									
Month: January	1988								
	Cowlitz	Late Coho	Cowlitz	86	32.	1.448	0.1744	1162	0.02
	Cowlitz	Late Coho	Cowlitz	A	-0-	-0-	-0-	162	-0-
	Cowlitz	Spring Chinook	Cowlitz	86	13.	0.55	0.0664	1222	0.2
	Elokomin	Fall Chinook	Elokomin	87	880.	1.675	0.1172	11625	0.32
	Elokomin	Late Coho	Elokomin	86	34.	0.938	0.084	285	0.02
	Grays River	Early Coho	Grays River	86	27.	1.634	0.0522	100	0.02
	Grays River	Fall Chinook	Grays River	87	936.	0.808	0.0462	2600	0.19
	Grays River	Fall Chinook	Kalama Falls	87	945.	0.987	0.0564	1300	0.09
	Kalama Falls	Fall Chinook	Kalama Falls	87	1117.	0.858	0.0533	1130	0.05
	Kalama Falls	Late Coho	Kalama Falls	86	26.	1.316	0.1435	135	0.01
	Kalama Falls	Spring Chinook	Kalama Falls	87	916.	1.686	0.1054	1680	0.26
	Lewis River	Late Coho	Lewis River	86	31.	1.364	0.1131	1690	0.04
	Lewis River	Spring Chinook	Lewis River	86	10.	1.681	0.1106	368	0.07
	Lower Kalama	Early Coho	Kalama Falls	86	41.	1.239	0.0572	100	0.02
	Speelyai	Early Coho	Lewis River	86	25.	3.056	0.2104	100	0.07
	Speelyai	Spring Chinook	Kalama Falls	86	14.	1.255	0.1394	100	0.06
	Speelyai	Spring Chinook	Kalama Falls	87	420.	-0-	-0-	200	0.17
	Speelyai	Spring Chinook	Lewis River	87	319.	-0-	-0-	200	0.07
	Toutle	Early Coho	Grays River	86	28.	-0-	-0-	384	0.12
	Washougal	Early Coho	Washougal	86	33.	2.706	0.4693	500	0.02
								25043	
Month: February	1988								
	Cowlitz	Fall Chinook	Cowlitz	87	800.	-0-	-0-	9400	0.12
	Cowlitz	Late Coho	Cowlitz	86	29.	2.032	0.2449	2893	0.06
	Cowlitz	Spring Chinook	Cowlitz	86	10.	0.531	0.0641	590	0.1
	Elokomin	Fall Chinook	Elokomin	87	627.	1.581	0.1334	22306	0.49
	Elokomin	Late Coho	Elokomin	86	33.	1.133	0.0856	472	0.03
	Grays River	Early Coho	Grays River	86	23.	1.806	0.0577	200	0.04
	Grays River	Early Coho	Grays River	87	962.	0.826	0.0472	800	0.11
	Grays River	Fall Chinook	Grays River	87	603.	1.452	0.083	1200	0.06
	Grays River	Fall Chinook	Kalama Falls	87	483.	1.339	0.0765	1300	0.09
	Kalama Falls	Fall Chinook	Kalama Falls	87	825.	1.31	0.0815	8850	0.16
	Kalama Falls	Late Coho	Kalama Falls	86	21.	1.745	0.1904	405	0.04
	Kalama Falls	Spring Chinook	Kalama Falls	87	580.	1.862	0.1358	1565	0.24
	Lewis River	Early Coho	Lewis River	86	25.	1.247	0.1164	105	0.01
	Lewis River	Late Coho	Lewis River	86	27.	1.542	0.126	1067	0.03
	Lewis River	Spring Chinook	Lewis River	86	10.	1.644	0.1082	1327	0.24
	Speelyai	Early Coho	Lewis River	86	23.	2.853	0.1964	100	0.07
	Speelyai	Spring Chinook	Kalama Falls	86	14.	1.122	0.1246	100	0.06
	Speelyai	Spring Chinook	Lewis River	87	263.	-0-	-0-	1000	0.25
	Toutle	Early Coho	Grays River	86	-0-	-0-	-0-	210	0.07
	Washougal	Fall Chinook	Washougal	87	950.	-0-	-0-	2067	0.03
	Washougal	Late Coho	Washougal	86	26.	2.731	0.0557	500	0.02
								56457	
Month: March	1988								

	Cowlitz	Fall Chinook	Cowlitz	87	354.	-0-	-0-	30200	0.39
	Cowlitz	Late Coho	Cowlitz	86	25.	2.249	0.271	4200	0.08
	Cowlitz	Late Coho	Cowlitz	86	25.	2.249	0.271	8750	0.17
	Cowlitz	Late Coho	Cowlitz	87	849.	-0-	-0-	3600	0.06
	Cowlitz	Spring Chinook	Cowlitz	86	8.	0.593	0.0716	651	0.11
	Elokomin	Fall Chinook	Elokomin	87	276.	1.322	0.1871	4700	0.1
	Elokomin	Fall Chinook	Washougal	87	688.	1.255	0.1046	390	0.09
	Elokomin	Late Coho	Cowlitz	87	916.	0.748	0.0623	760	0.12
	Elokomin	Late Coho	Elokomin	86	20.	1.491	0.1261	3200	0.19
	Elokomin	Late Coho	Elokomin	87	752.	0.901	0.0772	970	0.08
	Grays River	Early Coho	Grays River	86	15.	2.426	0.0786	404	0.09
	Grays River	Early Coho	Grays River	87	508.	0.802	0.0451	1343	0.21
	Grays River	Fall Chinook	Big Creek	87	366.	1.451	0.0824	1020	0.04
	Grays River	Fall Chinook	Grays River	87	361.	0.914	0.0514	805	0.07
	Kalama Falls	Fall Chinook	Kalama Falls	87	368.	1.126	0.1313	7395	0.16
	Kalama Falls	Late Coho	Kalama Falls	86	16.	1.789	0.1952	270	0.03
	Kalama Falls	Late Coho	Kalama Falls	87	865.	0.917	0.0955	215	0.04
	Kalama Falls	Spring Chinook	Kalama Falls	87	354.	1.322	0.1653	1560	0.28
	Lewis River	Early Coho	Lewis River	86	20.	1.421	0.1327	15	E-3
	Lewis River	Late Coho	Lewis River	86	22.	1.76	0.145	137	E-3
	Lewis River	Late Coho	Lewis River	87	1075.	-0-	-0-	400	0.02
	Lewis River	Spring Chinook	Lewis River	86	8.	1.946	0.1232	345	0.06
	Lower Kalama	Early Coho	Kalama Falls	86	20.	1.482	0.0912	310	0.05
	Lower Kalama	Early Coho	Kalama Falls	87	563.	0.503	0.0629	629	0.11
	Lower Kalama	Early Coho	Washougal	87	851.	0.309	0.0386	107	0.05
	Speelyai	Early Coho	Lewis River	86	22.	-0-	-0-	100	0.07
	Speelyai	Spring Chinook	Kalama Falls	86	9.	1.223	0.1699	100	0.06
	Speelyai	Spring Chinook	Lewis River	87	249.	-0-	-0-	550	0.11
	Toutle	Early Coho	Grays River	86	17.	-0-	-0-	110	0.04
	Toutle	Fall Chinook	Grays River	87	250.	-0-	-0-	1021	0.04
	Washougal	Fall Chinook	Washougal	87	427.	-0-	-0-	12700	0.2
	Washougal	Late Coho	Washougal	86	22.	2.957	0.0603	2600	0.08
	Washougal	Late Coho	Washougal	87	854.	-0-	-0-	6500	0.18

								96057	
Month: April	1988								
	Cowlitz	Fall Chinook	Cowlitz	87	164.	-0-	-0-	5670	0.07
	Cowlitz	Late Coho	Cowlitz	86	20.	2.485	0.2994	9060	0.18
	Cowlitz	Late Coho	Cowlitz	87	399.	-0-	-0-	16350	0.24
	Cowlitz	Spring Chinook	Cowlitz	86	7.	0.657	0.0794	1300	0.22
	Cowlitz	Spring Chinook	Cowlitz	87	79.	-0-	-0-	1776	0.05
	Elokomin	Fall Chinook	Elokomin	87	156.	2.206	0.3123	1402	0.03
	Elokomin	Late Coho	Cowlitz	87	463.	1.258	0.1048	831	0.13
	Elokomin	Late Coho	Elokomin	86	20.	1.545	0.2272	638	0.04
	Elokomin	Late Coho	Elokomin	87	347.	1.021	0.0851	1048	0.08
	Elokomin	Late Coho	Kalama Falls	87	518.	1.218	0.1015	155	0.05
	Grays River	Early Coho	Grays River	86	14.	2.823	0.0914	256	0.06
	Grays River	Early Coho	Grays River	87	229.	1.335	0.0751	980	0.16
	Grays River	Fall Chinook	Big Creek	87	160.	1.014	0.0574	121	0.1
	Grays River	Fall Chinook	Grays River	87	156.	1.263	0.0919	1331	0.12
	Kalama Falls	Fall Chinook	Kalama Falls	87	208.	0.864	0.098	2855	0.08
	Kalama Falls	Late Coho	Kalama Falls	86	15.	1.918	0.1998	265	0.08
	Kalama Falls	Late Coho	Kalama Falls	87	505.	1.511	0.1574	1710	0.25
	Kalama Falls	Spring Chinook	Kalama Falls	87	255.	1.528	0.191	300	0.05
	Lewis River	Early Coho	Lewis River	86	18.	1.53	0.1428	51	E-2
	Lewis River	Late Coho	Lewis River	86	16.	1.616	0.1331	900	0.03

	Lewis River	Late Coho	Lewis River	87	757.	-0-	-0-	450	E-2
	Lower Kalama	Early Coho	Kalama Falls	86	17.	1.663	0.1023	240	0.04
	Lower Kalama	Early Coho	Kalama Falls	87	470.	-0-	-0-	1680	0.3
	Lower Kalama	Early Coho	Washougal	87	446.	-0-	-0-	570	0.25
	Lower Kalama	Fall Chinook	Kalama Falls	87	246.	-0-	-0-	2135	0.06
	Speelyai	Early Coho	Lewis River	86	20.	-0-	-0-	50	0.03
	Speelyai	Spring Chinook	Lewis River	87	55.	-0-	-0-	1500	0.61
	Toutle	Early Coho	Grays River	86	14.	-0-	-0-	153	0.05
	Toutle	Fall Chinook	Grays River	87	166.	-0-	-0-	31500	1.37
	Washougal	Fall Chinook	Washougal	87	226.	0.778	0.0195	8700	0.14
	Washougal	Late Coho	Washougal	86	19.	2.339	0.0752	800	0.16
	Washougal	Late Coho	Washougal	87	449.	-0-	-0-	3200	0.08

								97977	
Month: May	1988								
	Cowlitz	Fall Chinook	Cowlitz	87	80.	1.22	0.1526	16700	0.22
	Cowlitz	Late Coho	Cowlitz	87	175.	0.353	0.051	24450	0.38
	Cowlitz	Spring Chinook	Cowlitz	87	65.	0.136	0.017	15858	2.34
	Elokomin	Early Coho	Grays River	87	157.	0.554	0.0416	1157	0.2
	Elokomin	Fall Chinook	Elokomin	87	74.	2.865	0.4192	1766	0.04
	Elokomin	Late Coho	Elokomin	87	197.	0.723	0.0412	1941	0.1
	Elokomin	Late Coho	Kalama Falls	87	244.	1.133	0.085	337	0.1
	Grays River	Early Coho	Grays River	87	199.	1.428	0.0803	385	0.06
	Grays River	Fall Chinook	Grays River	87	129.	1.412	0.1015	163	0.01
	Kalama Falls	Fall Chinook	Kalama Falls	87	100.	1.066	0.109	4545	0.15
	Kalama Falls	Late Coho	Kalama Falls	86	12.	2.334	0.2431	15	E-3
	Kalama Falls	Late Coho	Kalama Falls	87	246.	1.005	0.1256	375	0.06
	Kalama Falls	Spring Chinook	Kalama Falls	87	188.	0.868	0.1176	345	0.06
	Lewis River	Late Coho	Lewis River	87	363.	1.102	0.1653	172	E-3
	Lower Kalama	Early Coho	Kalama Falls	87	250.	0.852	0.0106	960	0.17
	Lower Kalama	Early Coho	Washougal	87	280.	0.087	0.0011	525	1.72
	Lower Kalama	Fall Chinook	Kalama Falls	87	200.	0.894	0.0348	650	0.06
	Speelyai	Early Coho	Lewis River	86	16.	-0-	-0-	50	0.03
	Speelyai	Early Coho	Lewis River	87	197.	-0-	-0-	795	0.06
	Toutle	Fall Chinook	Grays River	87	73.	2.496	0.096	7424	0.32
	Washougal	Fall Chinook	Washougal	87	128.	1.873	0.0379	2847	0.05
	Washougal	Late Coho	Cowlitz	87	242.	-0-	-0-	10016	0.57
	Washougal	Late Coho	Washougal	86	17.	2.582	0.08	775	0.15
	Washougal	Late Coho	Washougal	87	262.	-0-	-0-	4507	0.25

								96758	
Month: June	1988								
	Cowlitz	Fall Chinook	Cowlitz	87	59.	0.396	0.0494	10239	1.08
	Cowlitz	Late Coho	Cowlitz	86	18.	2.331	0.2914	5400	0.54
	Cowlitz	Late Coho	Cowlitz	87	110.	0.952	0.1215	6242	0.1
	Cowlitz	Spring Chinook	Cowlitz	87	43.	0.234	0.0292	2608	0.39
	Elokomin	Early Coho	Grays River	87	115.	0.681	0.0511	679	0.11
	Elokomin	Fall Chinook	Elokomin	87	71.	2.949	0.1966	900	0.02
	Elokomin	Late Coho	Elokomin	87	102.	0.573	0.0411	1483	0.08
	Kalama Falls	Fall Chinook	Kalama Falls	87	63.	1.519	0.1705	3015	0.1
	Kalama Falls	Late Coho	Kalama Falls	87	139.	0.544	0.0687	3555	0.37
	Kalama Falls	Spring Chinook	Kalama Falls	87	115.	0.639	0.089	880	0.16
	Lewis River	Spring Chinook	Lewis River	87	53.	0.724	0.0348	770	0.15
	Lower Kalama	Early Coho	Kalama Falls	87	171.	0.851	0.0106	75	0.01
	Lower Kalama	Early Coho	Washougal	87	171.	0.096	0.0012	35	0.11

	Speelyai	Early Coho	Lewis River	86	14.	1.894	0.1052	50	0.03
	Speelyai	Early Coho	Lewis River	a7	106.	1.531	0.0891	4600	0.32
	Washougal	Early Coho	Kalama Falls	a7	148.	2.579	0.0825	1089	0.18
	Washougal	Fall Chinook	Washougal	a7	76.	2.687	0.0543	1377	0.02
	Washougal	Late Coho	Cowlitz	a7	165.	1.7	0.0577	16094	0.93
	Washougal	Late Coho	Washougal	a7	161.	1.952	0.071	6969	0.39

								66060	
Month: July	1988								
	Cowlitz	Fall Chinook	Cowlitz	a7	43.	0.48	0.06	3480	0.37
	Cowlitz	Late Coho	Cowlitz	a7	82.	0.972	0.1238	15000	0.27
	Cowlitz	Spring Chinook	Cowlitz	a7	36.	0.252	0.0315	18802	2.81
	Elokomin	Early Coho	Grays River	a7	78.	0.936	0.0702	772	0.13
	Elokomin	Late Coho	Elokomin	a7	74.	0.751	0.0517	a4	E-3
	Kalama Falls	Late Coho	Kalama Falls	a7	101.	0.778	0.0819	225	0.02
	Kalama Falls	Spring Chinook	Kalama Falls	a7	92.	0.919	0.1281	660	0.12
	Lewis River	Spring Chinook	Lewis River	a7	34.	1.07	0.0474	a93	0.17
	Speelyai	Early Coho	Lewis River	a7	78.	1.903	0.111	900	0.07
	Washougal	Early Coho	Kalama Falls	a7	131.	1.932	0.066	1857	0.31
	Washougal	Fall Chinook	Washougal	a7	52.	1.59	0.0685	840	0.17
	Washougal	Late Coho	Cowlitz	a7	134.	1.474	0.0507	3450	0.2
	Washougal	Late Coho	Washougal	a7	128.	1.678	0.0612	2846	0.16

								49809	
Month: August	1988								
	Cowlitz	Fall Chinook	Cowlitz	a7	21.	0.773	0.0966	4560	0.49
	Cowlitz	Late Coho	Cowlitz	a7	65.	1.122	0.1429	26400	0.47
	Cowlitz	Spring Chinook	Cowlitz	a7	33.	0.268	0.0335	3300	0.5
	Elokomin	Early Coho	Grays River	a7	59.	1.246	0.0796	265	0.05
	Elokomin	Late Coho	Elokomin	a7	57.	0.958	0.0604	600	0.03
	Kalama Falls	Late Coho	Kalama Falls	a7	64.	0.656	0.069	415	0.04
	Kalama Falls	Spring Chinook	Kalama Falls	a7	53.	0.833	0.0965	225	0.04
	Lewis River	Late Coho	Lewis River	a7	83.	1.714	0.0952	1212	0.03
	Lewis River	Spring Chinook	Lewis River	a7	33.	0.914	0.0474	493	0.09
	Speelyai	Early Coho	Lewis River	a7	57.	2.387	0.1393	700	0.05
	Washougal	Early Coho	Kalama Falls	a7	85.	2.608	0.0874	a42	0.14
	Washougal	Late Coho	Cowlitz	a7	84.	2.117	0.0728	6754	0.4
	Washougal	Late Coho	Washougal	a7	82.	2.33	0.0849	5234	0.3

								51000	
Month: September	1988								
	Cowlitz	Fall Chinook	Cowlitz	87	15.	0.948	0.1185	2200	0.24
	Cowlitz	Late Coho	Cowlitz	a7	50.	1.181	0.1504	6500	0.13
	Cowlitz	Spring Chinook	Cowlitz	a7	24.	0.332	0.0415	3900	0.59
	Elokomin	Early Coho	Grays River	87	41.	1.728	0.1104	156	0.03
	Elokomin	Late Coho	Elokomin	a7	43.	1.421	0.0791	757	0.04
	Kalama Falls	Late Coho	Kalama Falls	a7	55.	0.963	0.1217	425	0.04
	Kalama Falls	Spring Chinook	Kalama Falls	a7	42.	1.155	0.158	1090	0.2
	Lewis River	Spring Chinook	Lewis River	a7	27.	0.872	0.0563	1986	0.39
	Speelyai	Early Coho	Lewis River	a7	53.	1.896	0.1383	300	0.02
	Washougal	Early Coho	Kalama Falls	a7	70.	2.907	0.0974	2989	0.5
	Washougal	Late Coho	Cowlitz	a7	71.	0.886	0.0155	5566	0.33
	Washougal	Late Coho	Washougal	a7	68.	1.005	0.017	6652	0.39

									32521	
Month: October	1988									
	Cowlitz	Late Coho	Cowlitz	87		47.	-0-	-0-	2900	0.06
	Cowlitz	Spring Chinook	Cowlitz	87		21.	-0-	-0-	2100	0.32
	Elokomin	Early Coho	Grays River	87		38.	1.661	0.1061	721	0.12
	Elokomin	Late Coho	Elokomin	87		38.	1.525	0.0798	1225	0.07
	Kalama Falls	Fall Chinook	Kalama Falls	88	-0-		-0-	-0-	433800	7.18
	Kalama Falls	Fall Chinook	Kalama Falls	A	-0-		-0-	-0-	82	2.39
	Kalama Falls	Late Coho	Kalama Falls	87		38.	1.362	0.1577	295	0.03
	Kalama Falls	Spring Chinook	Kalama Falls	88	-0-		-0-	-0-	116400	11.4
	Kalama Falls	Spring Chinook	Kalama Falls	A	-0-		-0-	-0-	112	12.
	Lewis River	Late Coho	Lewis River	87		69.	1.748	0.1068	100	E-3
	Lewis River	Spring Chinook	Lewis River	87		16.	1.188	0.0752	1367	0.27
	Lower Kalama	Spring Chinook	Kalama Falls	87		39.	1.466	0.064	620	0.11
	Speelyai	Early Coho	Lewis River	87		42.	2.22	0.1618	1000	0.08
	Washougal	Early Coho	Kalama Falls	87		62.	3.144	0.1094	666	0.11
	Washougal	Late Coho	Cowlitz	87		52.	2.203	0.0353	626	0.04
	Washougal	Late Coho	Washougal	87		53.	2.036	0.0489	1249	0.07

									563263	
Month: November	1988									
	Cowlitz	Late Coho	Cowlitz	87		43.	1.302	0.1658	2800	0.06
	Cowlitz	Spring Chinook	Cowlitz	87		16.	0.422	0.0528	2900	0.44
	Elokomin	Late Coho	Elokomin	87		32.	1.533	0.0895	1245	0.07
	Grays River	Early Coho	Big Creek	87		31.	1.62	0.0424	38	0.01
	Kalama Falls	Late Coho	Kalama Falls	87		30.	1.458	0.1841	325	0.03
	Lewis River	Late Coho	Lewis River	87		56.	1.83	0.122	897	0.02
	Lewis River	Spring Chinook	Lewis River	87		15.	1.494	0.0776	1796	0.36
	Lower Kalama	Early Coho	Kalama Falls	87		57.	1.16	0.0403	580	0.1
	Lower Kalama	Early Coho	Washougal	87		57.	1.225	0.0425	410	0.07
	Lower Kalama	Spring Chinook	Kalama Falls	87		35.	1.32	0.0739	600	0.11
	Speelyai	Early Coho	Lewis River	87		34.	2.58	0.1882	1000	0.08
	Washougal	Late Coho	Washougal	87		42.	2.174	0.041	128	E-3

									12719	
Month: December	1988									
	Cowlitz	Late Coho	Cowlitz	87		33.	1.549	0.1972	3300	0.07
	Cowlitz	Spring Chinook	Cowlitz	88		577.	1.043	0.0695	11000	0.3
	Cowlitz	Spring Chinook	Cowlitz	88		577.	1.043	0.0695	866000	23.5
	Elokomin	Early Coho	Elokomin	A	-0-		-0-	-0-	962	21.3
	Elokomin	Early Coho	Grays River	87		30.	1.23	0.0923	200	0.09
	Elokomin	Fall Chinook	Elokomin	88		1013.	1.845	0.1384	400	E-2
	Elokomin	Late Coho	Elokomin	87		30.	1.481	0.1042	638	0.04
	Grays River	Early Coho	Big Creek	87		29.	1.985	0.0463	152	0.04
	Grays River	Early Coho	Grays River	88	-0-		-0-	-0-	200000	7.43
	Grays River	Early Coho	Grays River	88		1143.	0.965	0.0546	4	E-3
	Grays River	Early Coho	Grays River	88		1143.	0.965	0.0546	200000	46.5
	Grays River	Fall Chinook	Elokomin	88	-0-		-0-	-0-	300000	9.45
	Grays River	Fall Chinook	Elokomin	88		888.	1.571	0.0898	2000	0.09
	Grays River	Fall Chinook	Elokomin	88		888.	1.571	0.0898	300000	13.
	Grays River	Fall Chinook	Grays River	88	-0-		-0-	-0-	289000	8.61
	Kalama Falls	Late Coho	Kalama Falls	87		30.	1.155	0.126	345	0.04
	Kalama Falls	Late Coho	Kalama Falls	88	-0-		-0-	-0-	55400	5.05

Lewis River	Late Coho	Lewis River	87	50.	1.98	0.132	1105	0.03
Lewis River	Spring Chinook	Lewis River	87	15.	1.487	0.0772	1617	0.32
Lower Kalama	Early Coho	Kalama Falls	87	46.	1.684	0.0673	465	0.08
Lower Kalama	Early Coho	Washougal	87	46.	0.156	0.0062	155	0.28
Lower Kalama	Spring Chinook	Kalama Falls	87	27.	0.765	0.0348	620	0.26
Speelyai	Early Coho	Lewis River	87	31.	2.427	0.1765	200	0.02
Speelyai	Early Coho	Lewis River	88	-0-	-0-	-0-	379000	13.2
Speelyai	Early Coho	Lewis River	A	-0-	-0-	-0-	57	3.16
Speelyai	Spring Chinook	Lewis River	88	971.	0.822	0.0352	3800	0.38
Speelyai	Spring Chinook	Lewis River	88	-0-	-0-	-0-	73000	13.1
Speelyai	Spring Chinook	Lewis River	88	971.	0.822	0.0352	73000	7.37
Speelyai	Spring Chinook	Lewis River	A	-0-	-0-	-0-	18	5.42
Speelyai	Spring Chinook	Lewis River	A	-0-	-0-	-0-	18	5.42
Washougal	Early Coho	Washougal	88	-0-	-0-	-0-	41000	13.3
Washougal	Early Coho	Washougal	A	-0-	-0-	-0-	40	6.9
Washougal	Fall Chinook	Washougal	88	-0-	-0-	-0-	612000	8.92
Washougal	Fall Chinook	Washougal	A	-0-	-0-	-0-	166	3.17
Washougal	Late Coho	Washougal	87	33.	2.599	0.049	31	E-3
Washougal	Late Coho	Washougal	A	-0-	-0-	-0-	60	2.17

							3415753	

UCol

Month: January 1988

Lyon's Ferry	Fall Chinook	Lyon's Ferry	86	14.	0.691	0.1036	136	0.28
Lyon's Ferry	Fall Chinook	Lyon's Ferry	86	13.	0.472	0.4094	81	0.09
Lyon's Ferry	Fall Chinook	Lyon's Ferry	86	12.	0.692	0.1038	283	0.18
Lyon's Ferry	Fall Chinook	Lyon's Ferry	86	14.	0.543	0.0525	104	0.08
Lyon's Ferry	Fall Chinook	Lyon's Ferry	87	1082.	-0-	-0-	554	0.15
Lyon's Ferry	Spring Chinook	Tucannon	87	352.	0.47	0.0392	560	0.34
Priest Rapids	Fall Chinook	Priest Rapids	87	1000.	-0-	-0-	2600	0.05
Rocky Reach	Early Coho	Big Creek	87	1000.	0.779	0.0973	1300	0.29
Rocky Reach	Early Coho	Kalama Falls	86	16.	1.255	0.1477	26	E-2
Rocky Reach	Fall Chinook	Priest Rapids	87	851.	0.643	0.1004	1400	0.67
Rocky Reach	Fall Chinook	Wells	86	12.	0.829	0.0975	73	0.03
Tucannon	Spring Chinook	Tucannon	86	10.	1.11	0.3115	467	0.3
Wells Spawning	Summer Chinook	Wells	87	591.	0.593	0.1141	3500	0.16

							11084	

Month: February 1988

Klickitat	Fall Chinook	Klickitat	87	437.	-0-	-0-	1115	1.68
Klickitat	Late Coho	Lewis River	87	1111.	-0-	-0-	1000	0.08
Klickitat	Spring Chinook	Klickitat	87	225.	-0-	-0-	1065	0.08
Lyon's Ferry	Fall Chinook	Lyon's Ferry	86	11.	0.589	0.0598	192	0.15
Lyon's Ferry	Fall Chinook	Lyon's Ferry	86	10.	0.75	0.0854	322	0.11
Lyon's Ferry	Fall Chinook	Lyon's Ferry	87	656.	-0-	-0-	9434	0.3
Lyon's Ferry	Spring Chinook	Tucannon	87	183.	0.751	0.0626	33	0.02
Priest Rapids	Fall Chinook	Priest Rapids	87	575.	-0-	-0-	57900	0.83
Rocky Reach	Early Coho	Big Creek	87	525.	0.855	0.1603	2436	0.57
Rocky Reach	Early Coho	Kalama Falls	86	15.	1.299	0.1528	100	0.02
Rocky Reach	Fall Chinook	Priest Rapids	87	520.	0.716	0.1342	1100	0.61
Rocky Reach	Fall Chinook	Wells	86	11.	0.874	0.1029	115	0.05
Tucannon	Spring Chinook	Tucannon	86	11.	0.	0.2804	825	0.53

							75637	

Month: March	1988								
	Klickitat	Late Coho	Lewis River	87	587.	-0-	-0-	3100	0.19
	Klickitat	Spring Chinook	Klickitat	87	138.	1.292	0.1354	1500	0.13
	Lyon's Ferry	Fall Chinook	Lyon's Ferry	86	8.	0.608	0.0789	190	0.15
	Lyon's Ferry	Fall Chinook	Lyon's Ferry	86	9.	0.976	0.1297	497	0.12
	Lyon's Ferry	Fall Chinook	Lyon's Ferry	87	350.	0.576	0.0966	6641	0.2
	Lyon's Ferry	Spring Chinook	Tucannon	87	108.	0.635	0.0896	48	0.03
	Priest Rapids	Fall Chinook	Priest Rapids	87	214.	0.998	0.1024	9800	0.13
	Rocky Reach	Early Coho	Big Creek	87	340.	0.473	0.1034	1725	0.41
	Rocky Reach	Early Coho	Big Creek	87	340.	0.473	0.1034	1725	0.41
	Rocky Reach	Early Coho	Kalama Falls	86	14.7	1.316	0.1548	20	E-3
	Rocky Reach	Fall Chinook	Priest Rapids	87	325.	0.425	0.0929	790	0.42
	Rocky Reach	Fall Chinook	Wells	86	10.2	0.925	0.1088	77	0.03
	Tucannon	Spring Chinook	Tucannon	86	10.	0.806	0.2261	498	0.44

								26611	
Month: April	1988								
	Klickitat	Late Coho	Lewis River	87	444.	-0-	-0-	300	0.02
	Klickitat	Spring Chinook	Klickitat	87	143.	0.776	0.0768	1500	0.14
	Lyon's Ferry	Fall Chinook	Lyon's Ferry	86	8.	0.726	0.1074	60	0.02
	Lyon's Ferry	Spring Chinook	Tucannon	87	79.	0.582	0.1086	98	0.06
	Priest Rapids	Fall Chinook	Priest Rapids	87	120.	-0-	-0-	4800	0.06
	Ringold	Fall Chinook	Lyon's Ferry	87	111.	1.059	0.2579	4000	0.21
	Rocky Reach	Early Coho	Big Creek	87	204.	0.437	0.0957	1600	0.39
	Rocky Reach	Early Coho	Kalama Falls	86	14.	0.972	0.1602	80	0.02
	Rocky Reach	Fall Chinook	Priest Rapids	87	215.	0.56	0.1224	400	0.22
	Rocky Reach	Fall Chinook	Wells	86	8.6	0.721	0.1188	455	0.2
	Tucannon	Spring Chinook	Tucannon	86	10.	0.815	0.2285	228	0.2

								13521	
Month: May	1988								
	Klickitat	Fall Chinook	Klickitat	87	98.	1.342	0.2135	775	0.03
	Klickitat	Late Coho	Cowlitz	86	15.	0.538	0.0612	800	0.19
	Klickitat	Late Coho	Lewis River	87	243.	1.304	0.1111	2030	0.14
	Klickitat	Spring Chinook	Klickitat	87	71.	1.61	0.0576	750	0.07
	Lyon's Ferry	Fall Chinook	Lyon's Ferry	87	51.	1.168	0.1547	1648	0.08
	Lyon's Ferry	Fall Chinook	Lyon's Ferry	87	51.	1.168	0.1547	2279	0.11
	Lyon's Ferry	Fall Chinook	Lyon's Ferry	87	112.	0.785	0.2452	1648	0.05
	Lyon's Ferry	Fall Chinook	Lyon's Ferry	87	112.	0.785	0.2452	2279	0.07
	Lyon's Ferry	Spring Chinook	Tucannon	87	60.	0.656	0.1258	173	0.11
	Priest Rapids	Fall Chinook	Priest Rapids	87	81.	1.105	0.1688	8500	0.11
	Rocky Reach	Early Coho	Big Creek	87	120.	0.596	0.1304	840	0.21
	Rocky Reach	Early Coho	Kalama Falls	86	13.	0.983	0.162	25	E-2
	Rocky Reach	Fall Chinook	Priest Rapids	87	125.	0.788	0.1725	500	0.27

								22247	
Month: June	1988								
	Klickitat	Fall Chinook	Klickitat	87	84.	1.151	0.1823	575	0.02
	Klickitat	Late Coho	Cowlitz	86	13.	0.25	0.0257	800	0.52
	Klickitat	Late Coho	Lewis River	87	133.	0.741	0.1288	6650	0.48
	Klickitat	Spring Chinook	Klickitat	87	69.	1.427	0.0384	750	0.11
	Lyon's Ferry	Spring Chinook	Tucannon	87	45.	0.164	0.0301	113	0.07
	Priest Rapids	Fall Chinook	Priest Rapids	87	68.	1.143	0.1904	12500	0.16

	Rocky Reach	Early Coho	Big Creek	87	83.	0.38	0.0427	796	0.2
	Rocky Reach	Fall Chinook	Priest Rapids	87	83.	0.391	0.1098	466	0.25

								22650	
Month: July	1988								
	Klickitat	Late Coho	Lewis River	87	99.	0.94	0.1385	3100	0.23
	Klickitat	Spring Chinook	Klickitat	87	42.	1.803	0.055	875	0.12
	Lyon's Ferry	Fall Chinook	Lyon's Ferry	87	54.	0.738	0.209	232	0.05
	Lyon's Ferry	Spring Chinook	Tucannon	87	32.	0.135	0.0383	148	0.09
	Rocky Reach	Early Coho	Big Creek	87	54.	0.503	0.0592	1024	0.26
	Rocky Reach	Fall Chinook	Priest Rapids	87	61.	0.327	0.0705	580	0.3

								5959	
Month: August	1988								
	Klickitat	Late Coho	Lewis River	87	77.	0.838	0.0362	1772	0.14
	Klickitat	Spring Chinook	Klickitat	87	38.	1.39	0.057	620	0.09
	Lyon's Ferry	Fall Chinook	Lyon's Ferry	87	48.	0.266	0.0576	344	0.08
	Lyon's Ferry	Spring Chinook	Tucannon	87	24.	0.162	0.046	87	0.06
	Rocky Reach	Early Coho	Big Creek	87	42.	0.598	0.0704	699	0.18
	Rocky Reach	Fall Chinook	Priest Rapids	87	46.	0.393	0.0847	332	0.17

								3854	
Month: September	1988								
	Klickitat	Late Coho	Lewis River	87	61.	0.982	0.0424	1638	0.13
	Klickitat	Spring Chinook	Klickitat	87	25.	1.021	0.0747	300	0.04
	Lyon's Ferry	Fall Chinook	Lyon's Ferry	87	35.	0.331	0.0716	300	0.07
	Lyon's Ferry	Spring Chinook	Tucannon	87	19.	0.205	0.0581	51	0.03
	Rocky Reach	Early Coho	Big Creek	87	32.	0.73	0.0859	1116	0.29
	Rocky Reach	Fall Chinook	Priest Rapids	87	32.	0.507	0.1093	213	0.11

								3618	
Month: October	1988								
	Klickitat	Late Coho	Lewis River	87	47.	1.144	0.048	996	0.08
	Klickitat	Spring Chinook	Klickitat	87	19.	1.106	0.0809	155	0.02
	Lyon's Ferry	Fall Chinook	Lyon's Ferry	87	30.	0.377	0.1143	134	0.03
	Lyon's Ferry	Spring Chinook	Tucannon	87	16.	0.219	0.0622	52	0.03
	Rocky Reach	Early Coho	Big Creek	87	26.	0.841	0.0989	570	0.15
	Wells Spawning	Summer Chinook	Wells	87	15.	1.118	0.139	127	0.03

								2034	
Month: November	1988								
	Klickitat	Late Coho	Lewis River	87	39.	1.296	0.057	470	0.04
	Klickitat	Spring Chinook	Klickitat	87	17.	1.177	0.0862	140	0.02
	Lyon's Ferry	Fall Chinook	Lyon's Ferry	87	25.	0.408	0.0885	229	0.05
	Rocky Reach	Early Coho	Big Creek	87	21.	0.784	0.1153	71	0.02
	Rocky Reach	Fall Chinook	Priest Rapids	87	18.	0.567	0.0617	615	0.32
	Tucannon	Spring Chinook	Tucannon	87	16.	0.812	0.2278	69	0.04
	Wells Spawning	Spring Chinook	Leavenworth	88	600.	0.41	0.0922	185	0.15

								1779	
Month: December	1988								

Klickitat	Early Coho	Klickitat	A	-0-	-O-	-0-	115	22.
Klickitat	Late Coho	Lewis River	87	34.	1.837	0.0918	674	0.06
Klickitat	Spring Chinook	Klickitat	87	15.	1.43	0.1046	155	0.02
Klickitat	Spring Chinook	Klickitat	88	-0-	-0-	-0-	106000	3.49
Klickitat	Spring Chinook	Klickitat	88	835.	1.014	0.0594	9834	0.34
Lyon's Ferry	Fall Chinook	Lyon's Ferry	87	23.	0.249	0.0491	275	0.06
Lyon's Ferry	Spring Chinook	Tucannon	88	847.	0.096	0.0208	1010	0.67
Lyon's Ferry	Spring Chinook	Tucannon	88	-0-	-0-	-0-	11100	6.09
Lyon's Ferry	Spring Chinook	Tucannon	88	847.	0.096	0.0208	11100	7.42
Rocky Reach	Early Coho	Big Creek	87	18.	0.837	0.1231	39	0.01
Rocky Reach	Fall Chinook	Priest Rapids	87	14.	0.646	0.0703	274	0.14
Rocky Reach	Late Coho	Cowlitz	88	-0-	-0-	-0-	56000	5.49
Tucannon	Spring Chinook	Tucannon	87	14.	0.882	0.2475	61	0.04
Wells Spawning	Spring Chinook	Leavenworth	88	180.	0.677	0.1524	178	0.1
Wells Spawning	Summer Chinook	Wells	87	13.	1.135	0.1479	94	0.02
Wells Spawning	Summer Chinook	Wells	88	1100.	0.693	0.1039	100000	12.3
Wells Spawning	Summer Chinook	Wells	88	-0-	-0-	-0-	100000	3.1

							396909	

Disease Category: Other
Agent: Pinhead

Basin	Location	Species	Stock	Brood	Size Fish/Lb	Flow Index	Density Index	Number Loss	% Loss
LCol									
Month: January	1988								
	Elokomin	Late Coho	Elokomin	86	34.	0.938	0.084	126	E-2
	Kalama Falls	Late Coho	Kalama Falls	86	26.	1.316	0.1435	115	0.01
								241	
Month: February	1988								
	Grays River	Fall Chinook	Grays River	87	603.	1.452	0.083	1400	0.08
	Grays River	Fall Chinook	Kalama Falls	87	483.	1.339	0.0765	1100	0.08
	Kalama Falls	Fall Chinook	Kalama Falls	87	825.	1.31	0.0815	410	E-2
	Kalama Falls	Late Coho	Kalama Falls	86	21.	1.745	0.1904	125	0.01
	Kalama Falls	Spring Chinook	Kalama Falls	87	580.	1.862	0.1358	40	E-2
	Lewis River	Early Coho	Lewis River	86	25.	1.247	0.1164	80	E-2
	Lewis River	Late Coho	Lewis River	86	27.	1.542	0.126	527	0.01
	Lewis River	Spring Chinook	Lewis River	86	10.	1.644	0.1082	115	0.02
								3797	
Month: March	1988								
	Cowlitz	Spring Chinook	Cowlitz	87	194.	-0-	-0-	2037	0.06
	Grays River	Fall Chinook	Big Creek	87	366.	1.451	0.0824	3481	0.14
	Grays River	Fall Chinook	Grays River	87	361.	0.914	0.0514	1510	0.13
	Kalama Falls	Fall Chinook	Kalama Falls	87	368.	1.126	0.1313	125	E-3
	Kalama Falls	Late Coho	Kalama Falls	86	16.	1.789	0.1952	90	E-2
	Kalama Falls	Spring Chinook	Kalama Falls	87	354.	1.322	0.1653	15	E-3
	Lewis River	Early Coho	Lewis River	86	20.	1.421	0.1327	50	E-2
	Lewis River	Late Coho	Lewis River	86	22.	1.76	0.145	526	0.01
	Lewis River	Spring Chinook	Lewis River	86	8.	1.946	0.1232	78	0.01
								7912	
Month: April	1988								
	Grays River	Early Coho	Grays River	87	229.	1.335	0.0751	145	0.02
	Grays River	Fall Chinook	Big Creek	87	160.	1.014	0.0574	30	0.02
	Grays River	Fall Chinook	Grays River	87	156.	1.263	0.0919	2019	0.18
	Kalama Falls	Fall Chinook	Kalama Falls	87	208.	0.864	0.098	3230	0.09
	Kalama Falls	Late Coho	Kalama Falls	86	15.	1.918	0.1998	10	E-3
	Kalama Falls	Late Coho	Kalama Falls	87	505.	1.511	0.1574	590	0.09
	Kalama Falls	Spring Chinook	Kalama Falls	87	255.	1.528	0.191	240	0.04
	Lewis River	Early Coho	Lewis River	86	18.	1.53	0.1428	28	E-3
	Lewis River	Late Coho	Lewis River	86	16.	1.616	0.1331	351	0.01
	Lewis River	Late Coho	Lewis River	87	757.	-0-	-0-	801	0.02
								7444	
Month: May	1988								
	Grays River	Early Coho	Grays River	87	199.	1.428	0.0803	30	E-2
	Grays River	Fall Chinook	Grays River	87	129.	1.412	0.1015	538	0.05
	Kalama Falls	Fall Chinook	Kalama Falls	87	100.	1.066	0.109	5255	0.17
	Kalama Falls	Late Coho	Kalama Falls	87	246.	1.005	0.1256	160	0.02

	Kalama Falls	Spring Chinook	Kalama Falls	87	188.	0.868	0.1176	435	0.08
	Lewis River	Late Coho	Lewis River	86	14.	2.776	0.2036	127	E-3
	Lewis River	Late Coho	Lewis River	87	363.	1.102	0.1653	7034	0.14

								13579	
Month: June	1988								
	Kalama Falls	Fall Chinook	Kalama Falls	87	63.	1.519	0.1705	2460	0.08
	Kalama Falls	Late Coho	Kalama Falls	87	139.	0.544	0.0687	630	0.07
	Kalama Falls	Spring Chinook	Kalama Falls	87	115.	0.639	0.089	960	0.18
	Lewis River	Late Coho	Lewis River	87	201.	1.152	0.0886	3713	0.08
	Lewis River	Spring Chinook	Lewis River	87	53.	0.724	0.0348	118	0.02

								7881	
Month: July	1988								
	Kalama Falls	Late Coho	Kalama Falls	87	101.	0.778	0.0819	620	0.07
	Kalama Falls	Spring Chinook	Kalama Falls	87	92.	0.919	0.1281	780	0.14
	Lewis River	Late Coho	Lewis River	87	134.	1.319	0.0718	1088	0.02
	Lewis River	Spring Chinook	Lewis River	87	34.	1.07	0.0474	123	0.02

								2611	
Month: August	1988								
	Kalama Falls	Late Coho	Kalama Falls	87	64.	0.656	0.069	535	0.06
	Kalama Falls	Spring Chinook	Kalama Falls	87	53.	0.833	0.0965	530	0.1
	Lewis River	Late Coho	Lewis River	87	83.	1.714	0.0952	1071	0.02
	Lewis River	Spring Chinook	Lewis River	87	33.	0.914	0.0474	106	0.02

								2242	
Month: September	1988								
	Kalama Falls	Late Coho	Kalama Falls	87	55.	0.963	0.1217	255	0.03
	Kalama Falls	Spring Chinook	Kalama Falls	87	42.	1.155	0.158	660	0.12
	Lewis River	Late Coho	Lewis River	87	77.	1.796	0.0998	2252	0.05
	Lewis River	Spring Chinook	Lewis River	87	27.	0.872	0.0563	378	0.07
	Lewis River	Spring Chinook	Lewis River	87	27.	0.872	0.0563	247	0.05

								3792	
Month: October	1988								
	Kalama Falls	Late Coho	Kalama Falls	87	38.	1.362	0.1577	130	0.01
	Lewis River	Late Coho	Lewis River	87	69.	1.748	0.1068	4836	0.11
	Lewis River	Spring Chinook	Lewis River	87	16.	1.188	0.0752	518	0.1

								5484	
Month: November	1988								
	Grays River	Early Coho	Big Creek	87	31.	1.62	0.0424	11	E-3
	Kalama Falls	Late Coho	Kalama Falls	87	30.	1.458	0.1841	195	0.02
	Lewis River	Late Coho	Lewis River	87	56.	1.83	0.122	5678	0.13
	Lewis River	Spring Chinook	Lewis River	87	15.	1.494	0.0776	269	0.05

								6153	
Month: December	1988								
	Kalama Falls	Late Coho	Kalama Falls	87	30.	1.155	0.126	125	0.01

	Lewis River	Late Coho	Lewis River	87	50.	1.98	0.132	368	E-2
	Lewis River	Spring Chinook	Lewis River	87	15.	1.487	0.0772	327	0.07

								820	

UCol

Month: February	1988								
	Rocky Reach	Fall Chinook	Priest Rapids	87	520.	0.716	0.1342	2560	1.42

								2560	
Month: March	1988								
	Rocky Reach	Fall Chinook	Priest Rapids	87	325.	0.425	0.0929	1520	0.82

								1520	
Month: April	1988								
	Rocky Reach	Fall Chinook	Priest Rapids	87	215.	0.56	0.1224	300	0.16

								300	
Month: August	1988								
	Klickitat	Late Coho	Lewis River	87	77.	0.838	0.0362	380	0.03

								380	
Month: September	1988								
	Klickitat	Late Coho	Lewis River	87	61.	0.982	0.0424	592	0.05

								592	
Month: October	1988								
	Klickitat	Late Coho	Lewis River	87	47.	1.144	0.048	510	0.04

								510	
Month: November	1988								
	Klickitat	Late Coho	Lewis River	87	39.	1.296	0.057	415	0.03

								415	
Month: December	1988								
	Klickitat	Late Coho	Lewis River	87	34.	1.837	0.0918	59	E-3

								59	

Disease Category: Other
Agent: Pre-spawning loss

Basin	Location	Species	Stock	Brood	Size Fish/Lb	Flow Index	Density Index	Number Loss	% LOSS
LCoL									
Month: October	1988								
	Elokomin	Fall Chinook	Elokomin	A	-0-	-0-	-o-	1070	22.5
								1070	
Month: November	1988								
	Kalama Falls	Early Coho	Kalama Falls	A	-0-	-O-	-O-	311	6.38
								311	
Month: December	1988								
	Cowlitz	Fall Chinook	Cowlitz	A	-o-	-o-	-0-	749	5.43
	Elokomin	Early Coho	Elokomin	A	-o-	-0-	-o-	962	21.3
	Elokomin	Late Coho	Elokcmin	A	-0-	-0-	-0-	299	6.11
	Elokomin	Late Coho	Elokcnnin	A	-0-	-0-	-0-	299	6.11
	Grays River	Early Coho	Grays River	A	-0-	-0-	-0-	15	0.55
	Grays River	Fall Chinook	Grays River	A	-0-	-0-	-0-	4	0.29
	Kalama Falls	Late Coho	Kalama Falls	A	-0-	-o-	-o-	334	17.4
	Kalama Falls	Late Coho	Kalama Falls	A	-0-	-o-	-0-	334	17.4
	Lower Kalama	Early Coho	Kalama Falls	A	-0-	-0-	-0-	47	4.11
	Lower Kalama	Early Coho	Kalama Falls	A	-0-	-0-	-0-	47	4.11
	Lower Kalama	Fall Chinook	Kalama Falls	A	-o-	-0-	-0-	185	21.6
	Lower Kalama	Fall Chinook	Kalama Falls	A	-0-	-0-	-0-	185	21.6
	Speelyai	Earty Coho	Lewis River	A	-0-	-0-	-0-	57	3.16
								3517	
UCoL									
Month: October	1988								
	KLickitat	Spring Chinook	Klickitat	A	-o-	-0-	-o-	175	12.3
	Wells Spawning	Sumner Chinook	Wells	A	-o-	-0-	-o-	21	1.79
								196	
Month: December	1988								
	Lyon's Ferry	Fall Chinook	Lyon's Ferry	A	-0-	-o-	-0-	21	1.5
	Tucannon	Spring Chinook	Tucannon	A	-0-	-0-	-0-	5	4.2
								26	

Disease Category: Other
Agent: Sunburn

Basin	Location	Species	Stock	Brood	Size Fish/Lb	Flow Index	Density Index	Number Loss	% Loss
UCoL									
Month: June	1988								
	Wells Spawning	Sumner	Chinook	Wells	87	42.	1.449	0.1119	2034	0.32
									2034	
Month: July	1988								
	Wells Spawning	Summer	Chinook	Wells	87	33.	0.605	0.0752	304	0.07
									304	

Disease Category: Other
Agent: Unknown

Basin	Location	Species	Stock	Brood	Size Fish/Lb	Flow Index	Density Index	Number Loss	% Loss
UCol									
Month: February	.1988								
	Elokomin	Fall Chinook	Elokomin	87	627.	1.581	0.1334	1740	0.04
								1740	
UCol									
Month: January	1988								
	Wells Spawning	Sumner Chinook	Wells	86	IO.	2.541	0.1681	473	0.12
								473	
Month: February	1988								
	Wells Spawning	Sumner Chinook	Wells	86	10.	2.442	0.1616	299	0.08
	Wells Spawning	Summer Chinook	Wells	87	301.	0.881	0.1375	149	E-2
								448	
Month: March	1988								
	Lyon's Ferry	Fall Chinook	Lyon's Ferry	87	350.	0.576	0.0966	7365	0.22
	Ringold	Fall Chinook	Lyon's Ferry	87	206.	1.012	0.2021	3000	0.16
	Wells Spawning	Sumner Chinook	Wells	86	10.	2.35	0.1555	55	0.01
								10420	
Month: April	1988								
	Lyon's Ferry	Fall Chinook	Lyon's Ferry	86	8.	0.591	0.0768	117	0.09
	Lyon's Ferry	Fall Chinook	Lyon's Ferry	86	8.	0.726	0.1074	306	0.11
	Lyon's Ferry	Fall Chinook	Lyon's Ferry	87	230.	-0-	-0-	684	0.02
	Ringold	Fall Chinook	Lyon's Ferry	87	111.	1.059	0.2579	3902	0.21
	Wells Spawning	Summer Chinook	Wells	86	8.	2.764	0.1829	77	0.02
								5086	
Month: May	1988								
	Lyon's Ferry	Fall Chinook	Lyon's Ferry	87	112.	0.785	0.2452	1690	0.05
	Lyon's Ferry	Fall Chinook	Lyon's Ferry	87	51.	1.168	0.1547	1690	0.08
								3380	
Month: June	1988								
	Lyon's Ferry	Fall Chinook	Lyon's Ferry	87	100.	0.614	0.1281	19	E-3
								19	
Month: August	1988								
	Wells Spawning	Sumer Chinook	Wells	87	26.	0.78	0.097	95	0.02
								95	

Month: September	1988									
	Wells	Spawning	Sumner	Chinook	Wells	87	16.	1.121	0.1394	34	E-2
										34	
Month: October	1988									
	Lyon's	Ferry	Fall	Chinook	Lyon's Ferry	87	30.	0.377	0.1143	22	E-2
										22	
Month: November	1988									
	Wells	Spawning	Sumner	Chinook	Wells	87	13.	1.243	0.1546	278	0.06
										278	
Month: December	1988									
	Klickitat		Late	Coho	Elokomin	88	-o-	-o-	-0-	1498000	83.2
										1498000	

Disease Category: Parasite
Agent: Gill Amoeba

Basin	Location	Species	stock	Brood	Size Fish/Lb	Flow Index	Density Index	Number Loss	% Loss
UCol									
Month: October	'1988								
	Rocky Reach	Fall Chinook	Priest Rapids	87	24.	0.617	0.133	530	0.27
								--.-.--	
								530	

Disease Category: Parasite
Agent: Ceratomyxosis

Basin	Location	Species	Stock	Brood	Size Fish/Lb	Flow Index	Density Index	Number Loss	% Loss
LCol									
Month: January	1988								
	Cowlitz	Spring Chinook	Cowlitz	86	13.	0.55	0.0664	407	0.07

								407	
Month: February	1988								
	Cowlitz	Spring Chinook	Cowlitz	86	10.	0.531	0.0641	148	0.02

								148	
Month: December	1988								
	Cowlitz	Fall Chinook	Cowlitz	A	-o-	-o-	-(-J-	83	0.6
	Cowlitz	Late Coho	Cowlitz	A	-0-	-0-	-o-	89	0.29
	Cowlitz	Late Coho	Cowlitz	A	-0-	-0-	-o-	89	0.29
	Cowlitz	Spring Chinook	Cowlitz	A	-Q-	-o-	-0-	44	0.48
	Washougal	Fall Chinook	Washouga 1	A	-o-	-o-	-o-	41	0.78

								346	

Disease Category: Parasite
Agent: Costia

Basin	Location	Species	Stock	Brood	Size Fish/Lb	Flow Index	Density Index	Number Loss	% Loss
LCol									
Month: March	1988								
	SpeeLyai	Spring Chinook	Lewis River	87	249.	-0-	-o-	550	0.11

								550	
Month: April	1988								
	Cowlitz	Fall Chinook	Cowlitz	87	164.	-0-	-o-	630	E-2
	Cowlitz	Spring Chinook	Cowlitz	87	79.	-o-	-0-	711	0.02

								1341	

Disease Category: Parasite
Agent: Ichthyophthirius

Basin	Location	Species	Stock	Brood	Size Fish/Lb	Flow Index	Density Index	Number Loss	% Loss
LCol									
Month: January	1988								
	Grays River	Fall Chinook	Grays River	87	936.	0.808	0.0462	25900	1.91
								25900	
Month: February	1988								
	Grays River	Fall Chinook	Grays River	87	603.	1.452	0.083	1400	0.08
	Grays River	Fall Chinook	Kalama Falls	87	483.	1.339	0.0765	700	0.05
								2100	
Month: March	1988								
	Grays River	Fall Chinook	Big Creek	87	366.	1.451	0.0824	639	0.03
	Grays River	FalI Chinook	Grays River	87	361.	0.914	0.0514	350	0.03
								989	
Month: December	1988								
	Grays River	Early Coho	Grays River	A	-0-	-0-	-o-	447	16.3
	Grays River	Fall Chinook	Elokomin	88	888.	1.571	0.0898	2417	0.1
	Grays River	Fall Chinook	Grays River	A	-0-	-0-	-0-	179	13.2
	Grays	Fall Chinook	Grays River	A	-o-	-0--	-0-	179	13.2
								3222	
UCol									
Month: September	1988								
	Wells Spawning	Sumner Chinook	Wells	87	16.	1.121	0.1394	8	E-3
								8	
Month: October	1988								
	Wells Spawning	Suner Chinook	Wells	87	15.	1.118	0.139	3188	0.74
								3188	

Disease Category: Parasite
Agent: PListophora

Basin	Location	Species	Stock	Brood	Size Fish/Lb	Flow index	Density Index	Number Loss	% Loss
LCol									
Month: March	1988								
	Lewis River	Spring Chinook	Lewis River	86	8.	1.946	0.1232	22	E-3
								___-_-_-	
								22	

Disease Category: Parasite
Agent: Sanguinicola

Basin	Location	Species	Stock	Brood	Size Fish/Lb	Flow Index	Density Index	Number Loss	% Loss
LCol									
Month: November	1988								
	Lewis River	Late Coho	Lewis River	87	56.	1.83	0.122	1195	0.03
	Lewis River	Spring Chinook	Lewis River	87	15.	1.494	0.0776	44	E-2
								1239	

Disease Category: Parasite
Agent: Trichodina

Basin	Location	Species	Stock	Brood	Size Fish/Lb	Flow Index	Density Index	Number LOSS	% LOSS
LCol									
Month: January	'1988 Elokomin	Late Coho	Elokomin	86	34.	0.938	0.084	20	E-3
								20	
Month: September	1988 Washougal	Early Coho	Kalama Falls	87	70.	2.907	0.0974	157	0.03
								157	

Disease Category: Viral
Agent: EIBS

Basin	Location	Species	Stock	Brood	Size Fish/Lb	Flow Index	Density Index	Number Loss	% Loss
LCol									
Month: October	1988								
	Lewis River	Spring Chinook	Lewis River	87	16.	1.188	0.0752	1962	0.39
								1962	
Month: November	1988								
	Lewis River	Spring Chinook	Lewis River	87	15.	1.494	0.0776	1487	0.3
								1487	
UCol									
Month: September	1988								
	Lyon's Ferry	Fall Chinook	Lyon's Ferry	87	35.	0.331	0.0716	1564	0.36
								1564	
Month: October	1988								
	Lyon's Ferry	Fall Chinook	Lyon's Ferry	87	30.	0.377	0.1143	1333	0.31
								1333	
Month: November	1988								
	Lyon's Ferry	Fall Chinook	Lyon's Ferry	87	25.	0.408	0.0885	504	0.12
								504	

Disease Category: Viral
Agent: IHNV

Basin	Location	Species	Stock	Brood	Size Fish/Lb	Flow Index	Density Index	Number Loss	% Loss
LCol									
Month: March	1988								
	Lewis River	Spring Chinook	Lewis River	86	8.	1.946	0.1232	798	0.15
								798	

APPENDIX E

Appendix E contains the Yearly Medication Report. Medication usage is listed by type of medication for each pathogen for the calendar year 1988.

Dosage:
Formalin = parts per million (ppm)
Diguat = ppm
Romet = % body weight fed of medicated feed
TM50 = % body weight fed of medicated feed
Gallimycin = % body weight fed of medicated feed
Sulmet = % body weight fed of medicated feed
Malachite = # of treatments per month
Epsom salts = % of feed by weight
Erythromycin = # of injections per month
Terramycin = # of injections per month

Amount:
Formalin = gallons
Diguat = gallons
Romet = pounds
TM50 = pounds
Gallimycin = pounds
Sulmet = pounds
Malachite = gallons
Epsom salts = pounds
Erythromycin & Terramycin = none

WDF PROGRAM MEDREP
Yearly Medication Report
July 14, 1989

Agent: Gill Amoeba

Medication	Dosage	Amount	Location	Species	Stock	Brood	Fish Size
Formalin	250	51G	Rocky Reach	Fall	Priest	87	24.

Agent: Bacterial Gill Dis

Medication	Dosage	Amount	Location	Species	Stock	Brood	Fish Size
Diquat	44PPM	4G	Lyon's Ferry	Fall	Lyon's	87	350.
	22PPM	3G	Lyon's Ferry	Fall	Lyon's	87	350.
	44PPM	21G	Lyon's Ferry	Fall	Lyon's	87	230.
	30PPM	20G	Lyon's Ferry	Fall	Lyon's	87	230.
	44PPM	18G	Lyon's Ferry	Fall	Lyon's	87	51'.
	34PPM	2G	Tucannon	Spring	Tucannon	86	11.

Agent: BBS

Medication	Dosage	Amount	Location	Species	Stock	Brood	Fish Size
TM50	.8%	44	Elokomin	Fall	Elokomin	87	880.

Agent: Bacterial Kidney Dis

Medication	Dosage	Amount	Location	Species	'Stock	Brood	Fish Size
Erythromycin							
	1		Cowlitz	Spring	Cowlitz	A	A
	1		Kalama Falls	Spring	Kalama	A	A
	1		Klickitat	Spring	Klickitat	A	A
	1		Priest Rapids	Fall	Priest	A	A
	1		Tucannon	Spring	Tucannon	A	A
	1		Wells	Summer	Wells	A	A
Gallimycin							
	2%	11085	Cowlitz	Fall	Cowlitz	87	21.
	2%	5944	Cowlitz	Fall	Cowlitz	87	15.
	2%	326	Cowlitz	Spring	Cowlitz	87	43.
	2%	2707	Cowlitz	Spring	Cowlitz	87	36.
	1%	13300	Klickitat	Late	Cowlitz	86	19.
	1%	1050	Klickitat	Late	Cowlitz	86	21.
	2%	288	Klickitat	Spring	Klickitat	87	138.
	2%	2618	Klickitat	Spring	Klickitat	87	38.
	1%	1650	Klickitat	Spring	Klickitat	87	38.
	2%	634	Klickitat	Spring	Klickitat	87	25.
	1.5%	4080	Lewis River	Spring	Lewis River	87	34.
	1.25%	9000	Lewis River	Spring	Lewis River	87	15.
	2%	1083	Lyon's Ferry	Fall	Lyon's	87	350.
	2%	2166	Lyon's Ferry	Fall	Lyon's	87	230.
	1%	1170	Lyon's Ferry	Fall	Lyon's	87	54.
	1%	480	Lyon's Ferry	Fall	Lyon's	87	54.
	2%	208	Lyon's Ferry	Spring	Tucannon	87	183.
	2%	90	Lyon's Ferry	Spring	Tucannon	87	108.
	1.5%	1217	Lyon's Ferry	Spring	Tucannon	87	32.
	2%	1932	Ringold	Fall	Lyon's	87	206.
	1.5%	52	Rocky Reach	Fall	Priest	87	325.
	1.5%	76	Rocky Reach	Fall	Priest	87	215.
	1.6%	1300	Rocky Reach	Fall	Priest	87	46.
	2%	450	Speelyai	Spring	Lewis River	87	249.
	2%	600	Speelyai	Spring	Lewis River	87	55.
	2%	2524	Wells	Summer	Wells	87	151.
	2%	4256	Wells	Summer	Wells	87	72.
	1.5%	2462	Wells	Summer	Wells	87	33.
	1.5%	830	Wells	Summer	Wells	87	26.

WDF PROGRAM MEDREP
Yearly Medication Report
July 14, 1989

Agent: Columnaris

Medication	Dosage	Amount	Location	Species	Stock	Brood	Fish Size
Diquat							
	16.8P	12G	Rocky Reach	Early	Big Creek	87	54.
Terramycin							
	1		Tucannon	Spring	Tucannon	A	A
TM50							
	2%	1030	Rocky Reach	Early	Big Creek	87	54.
	2%	1390	Rocky Reach	Early	Big Creek	87	42.
	2.4	660	Rocky Reach	Early	Big Creek	87	32.
	2%	450	Washougal	Early	Kalama	87	85.

Agent: Costia

Medication	Dosage	Amount	Location	Species	Stock	Brood	Fish Size
Formalin							
	167	189G	Cowlitz	Fall	Cowlitz	87	164.
	167	210G	Cowlitz	Late	Cowlitz	87	82.
	167	63G	Cowlitz	Spring	Cowlitz	87	79.
	167	40G	Elokomin	Early	Grays River	87	78.
	167	30G	Kalama Falls	Fall	Kalama	87	368.
	167	60G	Kalama Falls	Fall	Kalama	87	208.
	167	6G	Kalama Falls	Late	Kalama	87	505.
	167	6G	Kalama Falls	Late	Kalama	86	12.
	167	48G	Kalama Falls	Late	Kalama	87	101.
	167	4G	Kalama Falls	Spring	Kalama	87	580.
	167	6G	Kalama Falls	Spring	Kalama	87	354.
	167	6G	Kalama Falls	Spring	Kalama	87	255.
	167	52.8G	Lewis River	Late	Lewis River	87	363.
	167	44G	Lewis River	Late	Lewis River	87	201.
	167	55.G	Lewis River	Late	Lewis River	87	134.
	167	6G	Lower Kalama	Early	Kalama	87	470.
	167	3G	Lower Kalama	Early	Washougal	87	446.
	167	6G	Lower Kalama	Early	Kalama	87	250.
	167	2.x	Lower Kalama	Fall	Kalama	87	604.
	167	18G	Lower Kalama	Fall	Kalama	87	246.
	167	10G	Speelyai	Spring	Lewis River	87	249.

Agent: Cold Water Disease

Medication	Dosage	Amount	Location	Species	Stock	Brood	Fish Size
Romet							
	1%	148	Lewis River	Late	Lewis River	87	757.
	1%	578	Lewis River	Late	Lewis River	87	363.
	1.25%	122	Lewis River	Late	Lewis River	87	201.
TM50							
	2%	39000	Cowlitz	Late	Cowlitz	86	29.
	2%	19925	Cowlitz	Late	Cowlitz	86	25.
	2%	1884	Cowlitz	Late	Cowlitz	87	399.
	2%	6309	Cowlitz	Late	Cowlitz	87	175.
	2%	1550	Cowlitz	Late	Cowlitz	87	110.
	2%	9090	Cowlitz	Late	Cowlitz	87	82.
	2%	3640	Cowlitz	Late	Cowlitz	87	65.
	2%	4050	Cowlitz	Late	Cowlitz	87	33.
	2.5%	142	Elokomin	Late	Kalama	87	244.
	2%	192	Elokomin	Late	Elokomin	87	197.
	2.3%	3677	Elokomin	Late	Elokomin	87	102.
	2%	85	Elokomin	Late	Elokomin	87	74.
	2%	407	Grays River	Early	Grays River	87	229.
	2.5%	414	Grays River	Early	Grays River	87	199.
	2%	407	Grays River	Fall	Grays River	87	156.
	2%	748	Kalama Falls	Late	Kalama	87	246.
	2%	315	Kalama Falls	Late	Kalama	87	139.
	2%	685	Kalama Falls	Late	Kalama	87	101.
	2%	538	Klickitat	Late	Lewis River	87	444.
	2%	92	Klickitat	Late	Lewis River	87	2 4 3 .
	2%	473	Klickitat	Late	Lewis River	87	133.
	2%	2029	Klickitat	Late	Lewis River	87	99.
	2%	750	Lewis .River	Late	Lewis River	86	27.
	1.7%	698	Lewis River	Late	Lewis River	87	757.
	2%	2591	Lewis River	Late	Lewis River	87	363.
	2%	9574	Lewis River	Late	Lewis River	87	201.
	2%	878	Lewis River	Late	Lewis River	87	134.
	2%	15000	Lewis River	Late	Lewis River	87	77.
	1.5%	1300	Lewis River	Spring	Lewis River	87	27.
	1.5%	6200	Lewis River	Spring	Lewis River	87	16.
	2%	17	Lower Kalama	Early	Washougal	87	280.
	2%	332	Lower Kalama	Early	Kalama	87	250.
	2%	332	Lower Kalama	Early	Kalama	87	250.
	2%	223	Rocky Reach	Early	Big Creek	87	525.
	2%	146	Rocky Reach	Early	Big Creek	87	340.
	2%	146	Rocky Reach	Early	Big Creek	87	340.
	2%	102	Rocky Reach	Early	Big Creek	87	204.
	2%	649	Rocky Reach	Early	Big Creek	a7	83.
	2%	110	Rocky Reach	Fall	Priest	87	325.
	2%	704	Speelyai	Early	Lewis River	87	504.
	2%	200	Speelyai	Early	Lewis River	87	314.
	2%	976	Speelyai	Early	Lewis River	87	197.
	2%	590	Washougal	Late	Washougal	87	449.
	2%	216	Washougal	Late	Cowlitz	87	242.
	2%	963	Washougal	Late	Washougal	87	262.
	2%	1233	Washougal	Late	Washougal	87	161.
	2%	1172	Washougal	Late	Cowlitz	87	165.
	2%	94	Washougal	Late	Washougal	87	128.

Agent: Enteric Redmouth Dis

Medication	Dosage	Amount	Location	Species	Stock	Brood	Fish Size
Romet							
	1%	1145	Klickitat	Fall	Klickitat	87	179.
	1%	1466	Klickitat	Fall	Klickitat	87	98.
	1%	3173	Klickitat	Fall	Klickitat	a7	84.
	1%	385	Klickitat	Spring	Klickitat	87	143.
	1%	285	Klickitat	Spring	Klickitat	a7	71.
	2%	369	Lyon's Ferry	Fall	Lyon's	87	100.
TM50							
	2%	450	Cowlitz	Fall	Cowlitz	87	43.
	2%	4950	Cowlitz	Fall	Cowlitz	87	21.
	2%	4300	Cowlitz	Spring	Cowlitz	87	79.
	2%	4202	Cowlitz	Spring	Cowlitz	87	65.
	2%	127	Cowlitz	Spring	Cowlitz	87	43.
	1%	2860	Cowlitz	Spring	Cowlitz	87	14.
	2%	1000	Kalama Falls	Spring	Kalama	87	115.
	2%	43	Klickitat	Spring	Klickitat	a7	138.
	2%	1450	Lyon's Ferry	Fall	Lyon's	87	350.

Agent: Furunculosis

Medication	Dosage	Amount	Location	Species	Stock	Brood	Fish Size
Romet							
	1.5%	1050	Kalama Falls	Spring	Kalama	87	53.
Terramycin							
	1		Cowlitz	Fall	Cowlitz	A	A
	1		Kalama Falls	Fall	Kalama	A	A
	1		Kalama Falls	Spring	Kalama	A	A
TM50							
	1%	2860	Cowlitz	Spring	Cowlitz	87	14.
	2%	1500	Lower Kalama	Early	Kalama	87	57.
	2%	150	Lower Kalama	Fall	Kalama	87	200.
	2%	1500	Lower Kalama	Spring	Kalama	87	39.'
	2%	1500	Lower Kalama	Spring	Kalama	87	35.
	2%	1022	Washougal	Early	Kalama	a7	62.

Agent: Saprolegnia

Medication	Dosage	Amount	Location	Species	Stock	Brood	Fish Size
Formalin							
	100	572G	Cowlitz	Fall	Cowlitz	A	A
	200	1014G	Cowlitz	Late	Cowlitz	A	A
	200	3000G	Cowlitz	Spring	Cowlitz	A	A
	1667	650G	Cowlitz	Spring	Cowlitz	88	577.
	167	609G	Elokomin	Fall	Elokomin	A	A
	1667	25G	Grays River	Early	Grays River	88	1143.
	1667	30G	Grays River	Fall	Elokomin	88	888.
	1667	30G	Grays River	Fall	Grays River	88	E
	200	1000G	Kalama Falls	Fall	Kalama	A	A
	1667	150G	Kalama Falls	Fall	Kalama	88	E
	1667	1606	Kalama Falls	Late	Kalama	88	E
	167	15G	Kalama Falls	Late	Kalama	A	A
	1667	50G	Kalama Falls	Spring	Kalama	88	E
	200	1890	Kalama Falls	Spring	Kalama	A	A
	1667	254G	Klickitat	Fall	Priest	88	E
	1667	38G	Klickitat	Late	Elokomin	88	E
	167	1000G	Klickitat	Spring	Klickitat	A	A
	1667	200G	Klickitat	Spring	Klickitat	88	835.
	125	NA	Lewis River	Late	Lewis River	A	A
	1667	256	Lower Kalama	Early	Kalama	88	E
	167	NA	Lower Kalama	Early	Kalama	A	A
	1667	756	Lower Kalama	Fall	Kalama	88	E .
	167	156	Lower Kalama	Fall	Kalama	A	A
	1667	756	Lower Kalama	Fall	Elokomin	88	E
	143	1763G	Lyon's Ferry	Fall	Lyon's	A	A
	1667	9G	Lyon's Ferry	Spring	Tucannon	88	847.
	167	1242G	Priest Rapids	Fall	Priest	A	A
	167	148G	Rocky Reach	Fall	Priest	87	18.
	1667	30G	Rocky Reach	Late	Cowlitz	88	E
	1667	23G	Speelyai	Early	Lewis River	88	E
	200	4006	Speelyai	Early	Lewis River	A	A
	200	15236	Speelyai	Spring	Lewis River	A	A
	200	786G	Tucannon	Spring	Tucannon	A	A
	1667	30G	Washougal	Early	Washougal	88	E
	1667	75G	Washougal	Fall	Washougal	88	E
	1667	25G	Washougal	Fall	Priest	88	E
	167	1188G	Wells	Summer	Wells	A	A
	1667	122G	Wells	Summer	Wells	88	E
Malachite							
	1PPM	16G	Cowlitz	Spring	Cowlitz	A	A
	16	19.4#	Kalama Falls	Fall	Kalama	A	A
	1PPM	60G	Lyon's Ferry	Fall	Lyon's	A	A
	1PPM	12G	Priest Rapids	Fall	Priest	A	A

Agent: Ichthyophthirius

Medication	Dosage	Amount	Location	Species	Stock	Brood	Fish Size
Formalin							
	167	35G	Grays River	Early	Grays River	87	962.
	167	26G	Grays River	Fall	Grays River	87	936.
	167	200G	Grays River	Fall	Kalama	87	483.
	167	194G	Grays River	Fall	Grays River	87	603.
	167	140G	Grays River	Fall	Grays River	87	361.
	167	1256	Grays River	Fall	Big Creek	87	366.
	167	4206	Rocky Reach	Fall	Wells	86	12.
	167	4206	Rocky Reach	Fall	Wells	86	11.
	167	1506	Wells	Summer	Wells	87	16.
	167	6306	Wells	Summer	Wells	87	15.
	167	2976	Wells	Summer	Wells	87	13.

Agent: Prophylactic

Medication	Dosage	Amount	Location	Species	Stock	Brood	Fish Size
Terramycin							
	1		Lewis River	Early	Lewis River	A	A
	1		Lewis River	Late	Lewis River	A	A

Agent: Trichodina

Medication	Dosage	Amount	Location	Species	Stock	Brood	Fish Size
Formalin							
	25	29G	Elokomin	Late	Elokomin	86	34.
	167	17G	Washougal	Early	Kalama	87	70.

Agent: Unknown

Medication	Dosage	Amount	Location	Species	Stock	Brood	Fish Size
TM50							
	1.6%	44	Elokomin	Fall	Elokomin	87	627.

Appendix F. Adult Contribution of Index Station Stocks.

Hatchery: Cowlitz

Species	Tag Code Brood '82	% Survival	Tag Code Brood '83	% Survival	Tag Code Brood '84	% Survival
Spring	63 28/34	1.41	63 27/48	4.80	63 35/5	1.18
	63 28/35	1.04	63 27/47	4.74	63 35/6	1.49
	63 28/36	.89	63 30/54	3.20	63 35/7	1.86
			63 30/55	2.90	63 35/8	1.68
			63 30/56	5.77	63 35/9	1.75
			63 31/22	6.98	63 35/10	1.48
					63 35/11	1.86
					63 35/12	1.67
					63 34/37	1.19
Fall	63 26/10	04	63 30/19	.73	63 32/35	.27
	63 25/3	134	63 30/20	.94	63 32/36	.33
			63 31/24	.69	63 32/37	.26
			63 31/25	.80	63 32/38	.33
Fall Delayed			63 23/27	.73	63 34/48	.37
			63 23/28	.71	63 34/49	.30
					63 34/50	.70
					63 34/51	.70

Hatchery: Cowlitz

Species	Tag Code Brood '85	% Survival	Tag Code Brood '86	% Survival
Spring	63 38/33	NA	63 41/61R3	NA
	63 38/34	NA		
	63 38/35	NA		
Fall	63 41/8R4	NA	63 41/26R4	NA

Hatchery: Speelyai

Species	Tag Code Brood '82	% Survival	Tag Code Brood '85	% Survival	Tag Code Brood '86	% survival
Early Coho	63 30/15	.16	63 37/l	NA	63 44/50R3	NA
	63 30/16	.58	63 37/2	NA		
			63 36/63	NA		

Appendix F. Adult Contribution of Index Station Stocks.

Hatchery: Lyons Ferry

Species	Tag Code Brood '83	% Survival	Tag Code Brood '84	% Survival	Tag Code Brood '85	% Survival
Fall	63 32/18	7.32	63 28/41	.49	63 36/38	02
	63 21/52	6.84	63 32/26	.56	63 36/39	:04
			63 32/27	59	63 36/40	. 03
			63 32/28	148	63 36/41	.03
					63 36/42	05
					63 41/56R3	:31
					63 41/59R3	.27
Fall Barge Transport					63 36/33	NA
					63 36/34	.05
					63 36/35	.02
					63 36/36	.03
					63 36/37	. 04

Hatchery: Lyons Ferry

Species	Tag Code Brood '86	% Survival
Fall	63 42/59R6	NA
	63 42/61R6	NA
	63 42/62R6	.06
	63 44/1R6	08
	63 44/11R6	'NA
	63 44/13R6	NA
Fall'	63 44/7R6	NA
Barged	63 44/8R6	NA

APPENDIX G

Appendix G contains the hematocrit and leucocrit data by lot for the 1988 releases. The data are sorted by species, location, and brood year with average, maximum and minimum hematocrits listed. Hematocrit and leucocrit is measured as a percentage of total blood volume.

A summary of hematocrit data for releases during 1987 and 1988 is included. Yearling and subyearling lots are listed by species, location and brood year.

Additionally, the results of the EIBS and BKD screening are included. These results are recorded number positive/number sampled.

Appendix G. Hematocrit Summary.

Yearling chinook lots, **1987** and **1988.**

Spring Chinook

		AVE	MAX	MIN
Cowlitz	BY85	36.2	44	23
	BY86	35.3	47	5
Kalama	BY85	NA	NA	NA
	BY86	32.9	39	26
Klickitat	BY85	41	54	30
	BY86	36.6	46	24
Lewis	BY85	35.9	47	26
	BY86	35.7	47	24
Ringold	BY86	43.4	57	**31**
Speelyai	BY86	35.1	43	26
Tucannon	BY85	40.2	51	33
	BY86	39	57	31

Mean hematocrit Cby brood year)

BY85	38.3
BY86	36.9

Mean hematocrit 34.3
(all lots)

Mean hemat range 32.9-43.4
Call lots)

Fall Chinook

		AVE	MRX	MIN
Lyons	BY85	43.7	52	35
	BY86	42.3	50	33
Ringold	BY85	41.4	51	28
R. Reach	BY85	41.5	50	27
	BY86	38.4	47	22

Mean hematocrit (by brood year)

BY85	42.2
BY86	40.4

Mean **hematocrit** **41.7**
Call lots)

Mean hemat range 38.4-43.7
(all lots)

Summer Chinook

		AVE	MAX	MIN
Wells	BY85	34.8	44	30
	BY86	34.2	42	4

Mean hematocrit 34.5
Call lots)

Mean hemat range 34.2-34.8
Call lots)

Rppendix G. Hematocrit Summary.

Yearling coho **lots, 1987** and **1988.**

Late Coho

		AVE	MAX	MIN
Cowlitz	BY85	36.2	43	30
	BY86	31.8	39	20
Elokomin	BY85	39.6	49	29
	BY86	36.7	44	27
Kalama	BY85	33.5	41	25
	BY86	31.1	41	19
Kl ickitat	BY85	40.6	48	27
	BY86	32.7	42	23
Lewis	BY85	35.3	45	27
R. Reach	BY85	41.6	52	28
	BY86	37.9	46	30
Washougal	BY85	29.8	42	21
	BY86	35.5	51	**18**

Mean hematocrit Cby brood year)

BY85	36.7
BY86	34.3

Mean **hematocrit** 35.6
Call lots)

Mean hemat range **29.8-41.6**
Call lots)

Early Coho

		RUE	MRX	MIN
Grays	BY85	29.1	40	3
	BY86	37.9	48	29
Kalama	BY85	37.9	53	28
(L.Kal)	BY86	27.1	38	10
Lewis	BY86	32.9	44	24
Tout **le**	BY86	32.2	38	**19**
Washouga **1**	BY85	29.4	39	19

Mean hematocrit **(by** brood year)

BY85	32.1
BY86	32.5

Mean hematocrit 32.4
Call lots)

Mean **hemat** range **27.1-37.9**
Call lots)

Rppendix **G. Hematocrit** Summary.

Subyearling release lots, 1987 and 1988,

Fall Chinook

		RUE	MAX	MIN
Cowl i tz	BY86	**31.9**	**41**	22
	BY86d	34.6	47	21
	BY87	35.3	45	28
	BY87d	34.5	43	26
Elokomin	BY86	35.2	42	27
	BY87	29.2	40	23
Grays	BY86	34	43	25
	BY86	33.9	44	20
	BY87	37	43	30
Kalama	BY86	34.6	42	29
	BY87	37.2	43	31
Kl ickitat	BY86	40.2	50	**17**
	BY86	39.4	47	**31**
	BY86	34.5	42	28
	BY87	33.9	41	26
L.Kalama	BY86	34.3	**41**	27
Lyons	BY86	41.6	**51**	**31**
	BY07	37.5	46	23

Fall Chinook

		AVE	MAX	MIN
Priest	BY86	42.6	52	35
	BY87	34.8	47	27
R. Reach	BY86	37.5	39	36
Toutle	**BY87**	**31.5**	39	22
Washouga1	BY86	34.3	41	26
	BY87	30.1	36	23

Mean hematocrit Cby brood year)

BY86	36.3
BY87	34.1

Mean hematocrit 35.1
(all lots>

Mean **hemat** range 29.2-42.6
(all lots>

Appendix G. Hematocr t Leucocrit Data-1988 Re ea Lots

Spring Chinook Hematocrit Leucocrit Analysis

	Hatchery							
	Kalama Brood 86		Lewis Brood 86		Speel. Brood 86		Ringold Brood 85	
Fish #	Hemat.	Leuco.	Hemat.	Leuco.	Hemat.	Leuco.	Hemat.	Leuco.
1	35	0	25	0	38	1	44	0
2	34	0	34	0	38	1	45	0
3	32	0	36	0	38	1	35	0
4	33	0	39	0	26	1	48	0
5	34	0	47	0	38	0	46	0
6	33	0	36	0	36	1	42	0
7	33	0	38	0	34	0	50	0
8	30	0	40	0	37	0	38	0
9	37	0	37	0	35	1	35	0
10	37	0	38	0	29	1	44	0
11	37	0	31	0	37	1	50	0
12	34	0	31	0	34	1	53	0
13	31	0	30	0	43	0	52	0
14	30	0	36	0	41	0	51	0
15	37	0	34	0	32	0	47	0
16	28	0	37	0	39	1	57	0
17	31	0	36	0	32	3	46	0
18	36	0	35	0	39	0	48	0
19	37	0	27	0	38	0	48	0
20	38	0	39	0	35	1	36	0
21	38	0	40	0	38	1	43	0
22	33	0	34	0	30	0	52	0
23	33	0	38	0	37	1	52	0
24	33	0	38	0	38	1	54	0
25	30	0	36	0	36	1	49	0
26	36	0	36	1	26	0	46	0
27	36	0	34	1	35	2	50	0
28	34	0	35	0	34	1	48	0
29	34	0	37	0	37	1	52	0
30	30	0	35	0	32	1	44	0
31	36	0	39	0	37	1	46	0
32	38	0	37	0	38	1	44	0
33	33	0	31	0	34	1	47	0
34	26	0	38	0	35	1	56	0
35	31	0	35	0	35	1	50	0
36	29	0	31	0	35	1	47	0
37	35	0	34	0	33	2	31	0
38	28	0	40	0	30	1	48	0
39	27	0	28	0	36	1	39	0
40	37	0	40	0	33	1	40	0
41	33	0	31	1	30	1	36	1
42	34	0	35	0	36	1	38	0
43	30	0	40	0	34	0	36	1
44	31	0	39	0	38	1	38	0
45	28	0	39	0	39	0	35	1
46	31	0	32	0	34	1	38	0
47	29	0	34	0	38	1	37	0
48	32	0	35	0	41	1	37	0
49	28	0	37	0	31	0	38	0
50	29	0	37	0	37	1	34	0
51	31	0	42	1	27	1	33	0
52	32	0	37	0	36	1	36	0
53	35	0	37	0	36	1	38	0
54	30	0	39	0	34	0	33	0
55	33	0	24	0	34	1	39	0
56	36	0	38	0	33	1	45	0
57	39	0	39	1	32	1	38	0
58	33	0	37	0	37	0	35	0
59	31	0	35	0	32	0	40	1
60	37	0	33	0	37	1	35	0
AVG	32.9	0	35.7	0.1	35.1	0.8	43.4	0.1
MAX	39	0	47	1	43	3	57	1
MIN	26	0	24	0	26	0	31	0
EIBS	0pos/60		0pos/63		0pos/60		0pos/24	
BKD	0pos/60		22pos/63		20pos/60		23pos/29	

Appendix G. Hematocrit Leucocrit Data-1988 Release Lots

Spring Chinook Hematocrit Leucocrit Analysis

	Hatchery					
	Tucannon Brood 86		Klick. Brood 86		Klick. Brood 87	
Fish #	Hemat.	Leuco.	Hemat.	Leuco.	Hemat.	leuco.
1	32		34	1	32	1
2	37		33	0	33	1
3	39	1	37	1	29	1
4	57	0	33	0	33	1
5	41	0	32	1	30	1
6	38	0	39	1	32	1
7	43	0	40	1	32	1
8	32	0	40	0	30	1
9	44		30	1	29	1
10		8	40	0	34	0
11	38	0		0	29	1
12	45	0	31	1	27	1
13	41	0	40	0	31	0
14	36	0	34	1	31	1
is	42	0	40	1	25	1
16	40	0	34	0	30	1
17	39	0	38	1	28	i
18	36		34	1	27	
19	40	8	29	0	32	
20	44	0	24	0	32	a
21	31	0	34	1	33	0
22	43	0	35	0	30	1
23	38	0	37	0	33	1
24	37	0	34	1	27	1
25	45	0	33	0	30	0
26	44	0	37	0	33	1
27	36	0	28	0	30	1
28	43	0	34	0	27	1
29	40	0	38	1	28	1
30	42	0	30	2	27	0
31	38	0	42	1	29	1
32	40	0	38	1	27	1
33	37	0	40	0	31	1
34	35	0	35	0	33	1
35	31		38	0	29	1
36	33	8	38	0	36	1
37	40	0	33	0	28	1
38	39	0	33	0	30	1
39	37	0	34	0	32	0
40	33		39	1	30	1
41	39	8	39	1	28	0
42	34	0	38	0	30	0
43	35	0	40	1	32	0
44	31	0	38	0	31	1
45	37	0	35	1		
46	39	0	38	1	30	0
47	36	0	38	2	28	
48	35	0	40	0	29	
49	44	0	37	2	28	7
50	39	0	42	0	30	1
51	43		42	0	34	1
52	41	8	39	1	30	1
53	43		43	0	36	1
54	38	8	41	1	34	1
55	40	0	45	0	39	1
56	40	0	36	0	31	1
57	41	0	46	0	31	1
58	43	0			29	1
59	38	0	34	1	36	1
60	37	0	41	0	28	1
AVG	39.0	0	36.6	0.5	30.6	0.8
MAX	57	0	46	2	39	1
MIN	31	0	24	0	25	0
EIBS	4pos/60		1pos/60		1pos/60	
BKD	13pos/60		1pos/60		8pos/60	

Appendix G. Hematocrit Leucocrit Data-1988 Release Lots

Summer Chinook Hematocrit Leucocrit Analysis

	Hatchery			
	Wells Brood 86		Wells Brood 87	
Fish #	Hemat.	Leuco.	Hemat.	Leuco.
1	31	0	39	0
2	33	0	46	1
3	33	0	44	0
4	33	0	46	1
5	35	0	49	1
6	37	0	41	0
7	33	0	42	1
8	36	0	46	1
9	37	0	41	1
10	34	0	44	1
11	26	0	42	1
12	33	0	42	1
13	33	0	43	1
14	37	0	42	1
15	36	0	37	1
16	37	0	41	1
17	33	0	44	1
18	33	0	38	1
19	28	0	43	1
20	31	0	47	1
21	36	0	36	1
22	34	0	38	1
23	4	0	36	1
24	33	0	37	1
25	34	0	36	1
26	34	0	39	1
27	35	0	37	1
28	38	0	35	1
29	32	0	33	1
30	33	0	36	1
31	35	0	35	1
32	39	0	34	2
33	33	0	31	1
34	38	0	32	1
35	26	0	35	1
36	31	0	33	1
37	37	0	35	1
38	38	0	33	1
39	36	0	35	1
40	38	0	33	1
41	36	0	32	1
42	37	0	37	1
43	28	0	36	1
44	35	0	27	2
45	35	0	29	2
46	37	0	38	1
47	39	0	33	1
48	36	0	36	1
49	36	0	35	1
50	40	0	34	1
51	34	0	31	1
52	37	0	37	1
53	33	0	33	1
54	38	0	29	2
55	42	0	39	1
56	39	0	32	1
57	28	0	31	1
58	30	0	36	1
59	41	0	36	1
60	38	0	34	1
AVG	34.2	0	37.2	1.0
MAX	42	0	49	2
MIN	4	0	27	0
EIBS	0pos/60		20pos/60	
BKD	31pos/60		12pos/60	

Appendix G. Hematocrit Leucocrit Data - 1988 Release Lost

Fall Chinook Hematocrit Leucocrit Analysis

	Hatchery							
	R. Reach Brood 86		Toutle Brood 87		Elokomin Brood 87		Grays Brood 87	
Fish #	Hemat.	Leuco.	Hemat.	Leuco.	Hemat.	Leuco.	Hemats.	Leuco.
1	36	1	32	1	30	0	37	0
2	37	0	30	1	40	0	38	0
3	36	1	29	1	30	0	39	0
4	32	0	35	1	26	0		
5	39	1	29	1	36	0		
6	38	1	31	1	29	0	35	
7	42	1	32	1	34	0	32	8
8	35	0	32	3			36	0
9	36	1	31	0	33	0	38	0
10	37	0	28	0	33	0	39	0
11	39	1	28	0	28	0	30	0
12	35	0	33	1	35	1	36	0
13	34	1	37	0	25	1	30	0
14	37	0	30	0	32	0	33	0
15	43	1	35	1	34	1	35	0
16	42	0	31	1	33	1		
17	35	1	31	1	30	0	35	0
18	40	1	25	1	25	0	38	0
19	35	1	32	1	27	0	32	1
20	40	1	33	1	24	0	34	1
21	23	0	30	1	34	1	37	0
22	34	0	28	0	23	1	37	0
23	38	0	30	1	25	1	37	0
24	42	0	29	1	28	0	32	0
25	38	0	29	1	28	1	33	0
26	40	0	35	1	29	0	36	0
27	38	0	29	0	31	2	40	0
28	38	0	31	1	32	1	39	0
29	37	0	31	1	31	2	38	0
30	35	0	33	1	28	0	40	0
31	35	0	35	0			37	0
32	42	0	31	1	29	0	34	0
33	22	0	30	1	30	2	39	0
34	38	0	33	0	30	2	35	0
35	41	1	28	1	26	3	35	0
36	42	0	30	1	25	2	37	0
37	27	0	35	1	29	2	35	0
38	43	0	24	1	29	1	40	1
39	40	0	36	1	27	1	33	1
40	42	0	35	1	25	1	32	1
41	41	0	32	1	30	1	34	0
42	42	0	37	1	31	2	39	0
43	40	0	37	1	29	0	40	0
44	42	0	34	0	29	1	36	0
45	43	0	32	1	25	2	42	0
46	41	0	33	1	24	3	38	0
47	35	0	30	1	25	1	39	0
48	47	0	32	1	24	1	43	0
49	41	0	26	1	27	1	40	0
50	44	0	29	1	24	1	37	0
51	45	1	22	1	33	1	38	0
52	39	0	38	1			43	0
53	44	0	39	1	30	0	40	0
54	40	0	31	1	25	1	38	0
55	42	0	30	1	33	2	42	0
56	41	0	29	1	30	0	38	0
57	40	0	32	1	30	1	41	0
58	39	0	34	1	36	1	39	0
59	36	0	29	1	29	1		
60	41	0	36	1	26	1		
AVG	38.4	0.3	31.5	0.8	29.2	0.8	37	0.1
MAX	47	1	39	1	40	3	43	1
MIN	22	0	22	0	23	0	30	0
EIBS	4pos/60		0pos/60		0pos/60		0pos/60	
BKD	37pos/60		10pos/60		57pos/60		2pos/60	

Appendix **G.** Hematocrit Lcucocrit Data-1988 Release Lots

Fall Chinook Hematocrit leucocrit Analysis

	Hatchery							
	Kalama Brood 87		Klick.Brood8 7		Priest Brood 87		Washougal Brood8 7	
Fish #	Hemats.	Leuco.	Hema s.	Leuco.	iiemats.	Leuco.	Hemats.	Leuco.
1	36				36	0	34	1
2	34	8	35	0	31	2	28	
3	34	0			33	0	30	
4	33	0	40	0	34	2	31	
5	34	0	34	1	35	1	33	1
6	40	0	35	1	34	1	31	1
7	41	0	38	1	31	1	32	
8	40	0	34	1	34	1	27	
9	42	0	33	0	34	1	35	
10	41	0			35	1	29	
11	40	0	33	1	39	1	23	
12	33	0	38	0	36	0	28	
13			34	1	38	0	25	
14	36	0	37	1	35	0	32	
15	36	0	34	1	39	1	28	
16	40	0	35	2	38	0	30	
17	38		26	1	36	1	29	
18	40	8			37	0	26	
19	31	0	34	0	33	0	26	
23	32	0	30	1	33	0	26	
21	37	0	32	1	47	0	25	
22			40	0	36	0		
23	34	0	41	0	35	0	23	1
24	33	0	26	1	41	0	36	1
25	41	0	38	0	27	0	32	0
26	38		32	0	42	0	33	1
27	37	8	40	1	36	0	31	1
28	36	0	38	0	1	0	28	1
29	42	0	35	1	[illegible]	0	32	1
30			28	1	[illegible]	0	27	1
31	39	0	33	0	39	1	30	1
32	34	0	34	1	35	0	32	1
33	43		32	1	34	2	[illegible]	1
34	37	3	32	1	35	1	33	1
35	37	0	31	0	31	1	28	1
36	40	0	35	1	35	1	29	
37	36	0	35	1	31	0	30	
38	37	0	35	1	38	0	28	
39	31	0			37	0	30	
40	35	0	34	1			29	
41	35	0			32	1	30	
42	40	0	35	1	32	1	32	
43	37	0	34	1	34	1	35	0
44	35	0	35	1			35	0
45	42	0	35	1	29	1	31	0
46	39	0	36	1	33	1	35	0
47	36	0	33	1	33	1	35	0
48	33	0	35	1	29	1	31	1
49	39	0	35	0	37	1	29	
50	40	0	30	0	37	1		
51			33	1	36	1	32	
52	38	0	30	1	33		32	
53	35	0	34	1	38	1	34	0
54	34	0	29	2	34	1	31	
55	39	0	35	1	31		30	
56	[illegible]	0	3	1	[illegible]	1	[illegible]	
57			[illegible]	0	33			
58		[illegible]	4	1			4	
59	38				35			
60	[illegible]	[illegible]	31	1	[illegible]		27	
AVG	37.2	[illegible]	[illegible]	0.8	34.3	0.5		[illegible]
MAX	43	[illegible]	[illegible]	2	[illegible]	2	35	[illegible]
MIN	[illegible]	0	[illegible]	0	27	0	20	
[illegible]	0pos/60		[illegible]		0pos/60		[illegible]	
BKD	20[illegible]/60		9pos/60		[illegible]		[illegible]	

AppendixG . HematocritLeucocritData-1988ReleaseL o i s

Early Coho Hematocrit Leucocrit Analysis

	Hatchery					
	Grays Brood 86		L.Kalama Brood 86		Toutle Brood 86	
Fish #	Hemats.	Leuco.	Hemats.	Leuco.	Hemats.	Leuco.
1	41	1	25	1	33	1
2	41	2	28	0	30	2
3	41		32	0	33	1
4	43		37	0	36	1
5	39	2	28	0	35	1
6	39	1	30	1	32	1
7	48	2	32	0	27	1
8	39	2	27	0	34	1
9	36	2	33	1	27	2
10	33		25	0	34	1
11	45	6	38	0	35	1
12	40	2	23	0	34	1
13	44	0	25	0	32	1
14	37	2	32	1	35	1
15	41	2	32	1	35	1
16	38	1	32	0	31	1
17	39		29	0	20	1
18	29	3	34	0	32	1
19	38	1	28	0	31	1
20	37	1	28	0	34	1
21	34	2	23	0	28	1
22	40	1	23	1	37	1
[illegible]	41	1	26	0	32	1
24	35	2	20	0	33	1
25	37	1	25	0	[illegible]	0
26	34	2	30	1	23	
27	36	1	27	2	32	1
28	37	1	25	1	32	1
29	35	1	23	1	30	1
30	43	2	18	0	32	1
31	31	1	26	0	19	1
32	37	2	25	0	37	1
33	36	1	28	1	31	1
34	39	2	28	0	35	0
35	31	1	26	0	32	1
36	38	2	32	2	35	1
37	36	2	29	0	34	1
38	34	1	26	1	35	2
39	39	1	25	1	33	1
40	45	1	29	1	34	1
41		1			31	1
42	1f	2	24	1	33	1
43			28	1	32	1
44	36	5	26	1	36	1
45	40	1	29	1	32	2
46	39	1	19	0	29	1
47	37	1	24	1	31	1
48	36	1	30	1	28	1
49	40	2	30	0	35	0
50	36	1	10	0	37	0
51	39	0	28	0	29	1
52	36	1	19	0	35	1
53	35	1	30	0		
54	37	2	28	1	33	1
55	41	1	27	0	38	1
56	35	2	24	0	33	1
57	37	2	27	0	34	1
58	36	1	29	1	34	1
59		1	25	1	35	1
60	35	1	32	1	34	1
AVG	37.9	1.4	27.1	0.5	32.2	1
MAX	48	2	38	2	38	2
MIN	29	0	10	0	19	0
EIBS	0pos/62		1pos/60		1pos/60	
BKD	7pos/62		37pos/60		37pos/60	

Appendix G . Hematocrit Leucocrit Data-1988 Release Lots

Late Coho Hematocrit Leucocrit Analysis

	Hatchery							
	Cowlitz Brood 86		Elokomin Brood 86		Kalama Brood 86		Klick. Brood 86	
Fish #	Hemats.	Leuco.	Hemats.	Leuco.	Hemats.	Leuco.	Hemats.	Leuco.
1	32	0	36	1	33	0	40	0
2	29	0	40	1	41	1	37	0
3	35	2	35	2	30	0	37	0
4	30	2	30	1	32	1	41	0
5	30	1	40	2	35	1	35	0
6	30	1	41	2	22	0	35	0
7	29		35	2	34	2	35	1
8	30	8		2	31	1	34	0
9	30	2	a:	1	20	1	38	0
10	30	0	37	1	35	2	35	1
11	30	0	36	2	38	0	32	3
12	33	2	36	1	32		37	
13	28	1	39	1	25	a	36	1
14	24	2	38	1	38	1	29	0
15	28	0	30	1	20	0	30	0
16	26	2	35	1	22	0	26	3
17	27	2	36	1	34	2	32	0
18	33	2	33	2	32	0	23	0
19	27	2	40	2	30	0	35	0
20	20	1	35	1	20	0	37	0
21	24	2	35	2	35	0	25	[illegible]
22	32	2	34	1	25	0	30	0
23	32		37	2	29	2	31	[illegible]
24	32	4	38	1	39	1	23	3
25	34		38	2	25	0	31	[illegible]
26	30	3	34	1	28	0	31	[illegible]
27	33	1	34	1	26	0	25	[illegible]
28	33	2	35	2	37	0	33	[illegible]
29	31	2	33	1	31	1	35	[illegible]
30	29		37	2	40	1	35	[illegible]
31	33	2	37			0	32	[illegible]
32	36	1	39	1	34		24	[illegible]
33	34	2	38	2	32	2	34	[illegible]
34	37	0	40	2	26	0	35	
35	35	2	32	2	38	2	32	
36	34	2	40	0	37	2	33	
37	34	2	40	2	37	3	35	
38	35	2	40	1	30	0	37	
39	28	1	38	1	36	0	32	
40	35	1	34	1	40	1	33	
41	33	1		2	32	1	32	1
42	35	2	98	2	34	1	30	[illegible]
43	33	2	38	1	33	1	33	[illegible]
44	34	1	32	1	34	2	36	[illegible]
45	33	2	33	1	38	1	30	[illegible]
46	35	2	37	1	34	1	33	
47	29	2	27	1	23	0	30	1
48	32	2	35		34	0	33	[illegible]
49	39	1	36	3	35	1	35	
50	35	2	39	1	33	1	34	
51	34	1	42	1	19	0	27	[illegible]
52	37	1	38	2	36	1	30	[illegible]
53	38	1	35		24	0	38	
54	31	1	35		30	1	31	[illegible]
55	31	2	32	1	24	0	29	
56	31	1	37	2	30	1	33	[illegible]
57	37	1	41	2	39	1	35	[illegible]
58	34	1	37	1	25	3	32	[illegible]
59	28	1	38		28	2	43	[illegible]
60	35	2	40	4	24	3	22	[illegible]
AVG	31.8	1.5	36.7	1.5	31.1	0.7	32.7	0.7
MAX	39	4	44	2	41	2	42	
MIN	20	0	27	0	19	0	23	0
EIBS	0pos/60		0pos/60		4pos/60		1pos/60	
BKD	5pos/60		5pos/60		10pos/60		48pos/60	

Appendix G. HematocritLeucocrit Data-i988 Release Lots

Late Coho Hematocrit Leucocrit Analysis

	Hatchery			
	R.Reach Brood86		Washougal Brood 86	
Fish #	Hemats.	Leuco.	Hemats.	Leuco.
1	31	0	32	0
2	30	1	28	0
3	35	1	37	0
4	33	1	25	0
5	35	1	37	0
6	36	1	37	0
7	33	1	34	0
8	37	1	37	0
9	35	2	33	0
10	31	1	41	0
11	32	1	37	0
12	34	0	26	0
13	34	1	27	0
14	37	1	31	0
15	31		37	0
16	39	a	35	0
17	37		24	0
18	38	a	40	0
19	39	0	42	0
20	35	2	31	0
21	33		36	0
22	36	8	30	0
23	37		30	0
24	37	8	32	0
25	36	1	36	0
26	44	0	39	0
27	41	1	31	0
28	40	0	40	0
29	38	0	39	0
30	35	1	38	0
31	38		36	0
32	43	8	30	0
33	39		43	0
34	42	8		
35	42	0	31	0
36	39	0		
37	46	0		
38	42	0		
39	44	0		
40	40	0		
41	[illegible]		42	0
42	36	1	[illegible]	0
43	39	0	42	0
44	40	0	42	0
45	44	0	38	0
46	43	0	35	0
47	43	0	51	0
48	41	0	47	0
49	39		47	0
50	45	8	48	0
51	35	1	31	0
52	36	0	35	0
53	43	1	18	0
54	37	0	37	0
55	37	0	27	0
56	37	0	36	0
57	37		34	0
58	41	8	36	0
59	38	1	38	0
60	35	0	38	0
AVG	37.9	0.4	35.5	0
MAX	46	2	51	0
MIN	30	0	18	0
EIBS	0pos/60		0pos/60	
BKD	28pos/60		0pos/60	

Appendix H. **Organosomatic** Analysis Summary and raw data.

SUMMARY OF FISH AUTOPSY

LOCATION: Cowlitz QUAL. CONTROL INSPECT. **NO.**: 703

Species: Chincok Autops Date: 03/22/88 Sample Size: 60
Strain: Springs Age: Bf 86 Tissue Collection No.: 703
Mark/Lot: 63 41761 R3 Disease Survey No.: 703
Unit: Pd 21-24 Water Ternp.: 44 F Case History No.: 703
Fish SOUL-CC: Cowlitz Water Hardness: NA ppm Custody No.: 703
Egg Source: Cowlitz Investigator: PM/BR/JC
Hatching Date: NA Reason for Autopsy: Pre-Lib Exam
Remarks: Yearling release

	MEAN	STANDARD DEVIATION	COEFFICIENT OF VARIATION
Length	181.150 mm	25.17 mm	14%
Weight	58.260 gr	22.43 gr	39%
Ktl*	0.980	0.07	7%
Ctl**	3.541		
Hematocrit	35.330	7.13	20%
Leucocrit	0.520	0.79	151%
Serum Protein	5.500	0.86	16%

*Expressed as Ktl times 10 to the fifth power
**Converted from Ktl; expressed as Ctl times 10 to the fourth power

VALUES AS PERCENT OF TOTAL SAMPLE

EYES	GILLS	PSEUDO-BRANCHS	THYMUS	MESEN. FAT	SPLEEN	HIND GUT	KIDNEY	LIVER	BILE
N 100%	N 93%	N 77%	0 73%	5%	B 0%	0 100%	N 95%	A 2%	0 63%
B1 0%	F 0%	S 7%	1 27%	0 75%	R 98%	1 0%	S 5%	B 95%	1 37%
B2 0%	C 0%	L 2%	2 0f	2 20%	G 0%	2 0%	M 0%	C 3%	2 0%
E1 0%	M 0%	S&L 12%	x 0.3	3 0%	NO 0%	x 0.0	G 0%	D 0%	3 0%
E2 0%	P 7%	I 0%		4 0%	E 2%		U 0%	E 0%	x 0.4
H1 0%	OT 0%	OT 3%		x 1.2	OT 0%		OT 0%	F 0%	
H2 0%								OT 0%	
M1 0%									
M2 0%									
OT 0%									
Summary of Normals									
100%	93%	77%	73%		98%	100%	95%	97%	
Summary of Means									
			0.3	1.2		0.0 I			0.4

SEX: M: 45% F: 55% u: 0%

GENERAL REMARKS

FINS Frayed caudals, four fish--Frayed dorsals,three fish

SKIN #30 with pale pseudobranch and boils on side of body

GONADS NA

OTHER Pds 21-23,OMP2,MWF. Pd 24,Biodiet,MWF. l.0-1.7%BW

Appendix H.

Qual.Qual. Control N703 86-8A

SN	LGH	WGT	Ktl	EYE	GILL	PSBR	THY	FAT,	SPL	GUT	KID	LIV	BILE	SEX	HEM	LEU	SPR
1	110	12.5	0.9	N	N	N		1	R	0	N	B	0	F	41	0.0	4.7
2	153	32.2	0.9	N	N	N	8	1	R	0	N	B	0	M	42	0.0	6.5
3	160	37.3	0.9	N	N	N	0	2	R	0	N	B	1	F	44	0.0	6.4
4	175	47.3	0.9	N	N	N	0	1	R	0	N	B	0	M	30	0.0	5.0
5	172	49.2	1.0	N	N	S	1	1	R	0	N	B	0	F	45	0.0	6.2
6	157	36.1	0.9	N	N	N	0	1	R	0	N	B	0	M	47	0.0	7.5
7	139	27.7	1.0	N	N	N	0	2	R	0	N	B	0	F	38	0.0	6.0
8	168	46.8	1.0	N	N	N	0	1	R	0	N	B	1	M	25	0.0	4.8
9	207	85.5	1.0	N	N	N	0	1	R	0	N	B	0	M	33	0.0	5.2
10	220	100	0.9	N	N	N	0	1	R	0	N	B	1	M	37	0.0	5.6
11	130	20.8	0.9	N	N	N	0	1	R	0	N	B	0	F	38	0.0	6.0
12	140	27.7	1.0	N	N	N	0	2	R	0	S	B	0	M	35	0.0	5.3
13	202	80.2	1.0	N	N	N	1	1	R	0	N	C	0	M	25	0.0	5.0
14	199	74.2	0.9	N	N	N	1	1	R	0	N	B	0	F	38	0.0	5.0
15	198	69.6	0.9	N	N	N	0	1	R	0	N	B	0	F	39	0.0	5.4
16	181	57.8	1.0	N	N	S	0	2	R	0	N	B	0	F	30	0.0	5.0
17	208	86.3	1.0	N	N	N	0	2	R	0	N	B	0	M	37	1.0	6.6
18	184	61.8	1.0	N	N	N	1	2	R	0	N	B	0	M	41	1.0	6.4
19	188	57.7	0.9	N	N	N	1	1	R	0	N	B	0	F	36	1.0	5.7
20	219	56.9	0.5	N	N	N	1	1	R	0	N	B	0	M	39	1.0	5.2
21	162	40.2	0.9	N	N	N	0	2	R	0	N	B	1	M	37	0.0	5.9
22	150	33.7	1.0	N	N	S	0	1	R	0	N	B	0	F	33	0.0	6.0
23	192	66.1	0.9	N	N	N	0	1	R	0	N	B	0	F	39	1.0	5.2
24	180	55.1	0.9	N	N	N	0	2	R	0	N	B	1	F	39	0.0	5.0
25	128	18.8	0.9	N	N	N	1	1	R	0	N	B	0	F	44	0.0	5.6
26	179	50.4	0.9	N	N	S&L	0	1	R	0	N	B	1	F	42	1.0	6.1
27	154	30.9	0.8	N	N	N	0	1	R	0	N	B		F	36	1:0	5.7
28	179	57.4	1.0	N	P	N	0	1	R	0	N	B	8	F	29	0.0	5.6
29	230	123.	1.0	N	N	N	1	1	R	0	N	B	1	F	35	1.0	5.4
30	204	85	1.0	N	P	OT	0	1	E	0	S	C	1	M	5	5.0	3.5
31	194	67.2	0.9	N	N	L	0	1	R	0	N	B	1	M	31	1:0	5.3
32	174	48.3	0.9	N	N	N	0	1	R	0	N	B	0	M	42	1.0	5.7
33	172	45.3	0.9	N	N	N	0	1	R	0	N	B	1	F	42	0.0	7.8
34	153	34.5	1.0	N	N	N	1	1	R	0	N	B	1	M	46	0.0	6.8
35	195	67.2	0.9	N	N	N	0	1	R	0	N	B	0	F	42	0.0	6.0
36	191	62.1	0.9	N	N	N	0	1	R	0	N	B	0	F	38	1.0	5.4
37	150	30.4	0.9	N	N	S&L	0	1	R	0	N	B		F	39	1.0	6.0
38	200	76	1.0	N	N	S&L	0	2	R	0	N	B	8	F	35	0.0	5.8
39	222	107	1.0	N	N	S&L	0	1	R	0	N	B		M	32	0.0	6.0
40	174	51.1	1.0	N	N	N	0	1	R	0	N	B	8	M	37	0.0	4.8
41	157	34.5	0.9	N	P	OT	0	1	R	0	N	B	1	F	11	0.0	2.7
42	182	55.7	0.9	N	N	N	0	1	R	0	N	B	1	F	38	1.0	5.9
43	200	73.1	0.9	N	N	N	1	1	R	0	N	B	0	M	37	0.0	5.0
44	191	64.6	0.9	N	N	N	1	1	R	0	N	B	1	F	39	0.0	6.3
45	199	71	0.9	N	N	N	0	2	R	0	N	B	1	M	36	0.0	7.0
46	180	49.9	0.9	N	N	N	0	0	R	0	N	B	1	M	31	0.0	4.2
47	199	81.2	1.0	N	N	N	1	1	R	0	N	B	0	F	27	1.0	5.0
48	173	48.3	0.9	N	N	S&L	1	1	R	0	N	B	0	F	34	1.0	4.8
49	154	33.1	0.9	N	N	N	0	1	R	0	N	B	0	M	34	0.0	5:0
50	190	62.5	0.9	N	P	S&L	0	1	R	0	N	B	1	F	27	1.0	4.4
51	182	58.5	1.0	N	N	S&L	1	2	R	0	N	B		F	28	0	4.4
52	178	53.4	0.9	N	N	N	1	1	R	0	N	B	8	F	38	1	6.2
53	194	67.2	0.9	N	N	N	0	1	R	0	N	B	0	F	38	1	6.2
54	208	79	0.9	N	N	N	0	0	R	0	N	B	0	F	32	1	5.4
55	209	83.5	0.9	N	N	N	0		R	0	N	B	1	F		2	5.4
56	193	69.5	1.0	N	N	S	0		R	0	N	B	0	M	34	1	5.5
57	166	48.1	1.1	N	N	N	0	4	R	0	N	B	1	M	34	1	5.5
58	196	70.7	0.9	N	N	N	1	1	R	0	S	A	1	M	39	1	4.9
59	222	100.	0.9	N	N	N	0	1	R	0	N	B	1	M	32	1	4.9
60	203	74	0.9	N	N	N	0	1	R	0	N	B	1	M	33	1	4.2

Appendix H.

SUMMARY OF FISH AUTOPSY

LOCATION: Lyons Ferry QUAL. CONTROL INSPECT. NO.: 709

Species: Chinook Autopsy Date: 04/06/88 Sample Size: 60
Strain: Falls Age: BY 86 Tissue Collection No.: 709
Mark/Lot: See gen. remarks Disease Survey No.: 709
Unit: NA Water Temp.: 53 F Case History No.: 709
Fish Source: Lyons Water Hardness: NA ppm Custody No.: 709
Egg Source: Lyons Investigator: PM/JC
Hatching Date: NA Reason for Autopsy: Pre-lib Exam
Remarks: Yearling release groups

	MEAN	STANDARD DEVIATION	COEFFICIENT OF VARIATION
Length	189.950 mm	14.36 mm	8%
Weight	60.100 gr	12.2 gr	20%
Ktl*	0.880	0.05	5%
Ctl**	3.179		
Hematocrit	42.330	3.68	9%
Leucocrit	0.880	0.37	42%
Serum Protein	4.030	1.65	41%

*Expressed as Ktl times 10 to the fifth power
**Converted from Ktl; expressed as Ctl times 10 to the fourth power

VALUES AS PERCENT OF TOTAL SAMPLE

EYES	GILLS	PSEUDO-BRANCHS	THYMUS	MESEN. FAT	SPLEEN	HIND GUT	KIDNEY	LIVER	BILE
N 97%	N 100%	N 100%	0 53%	0 47%	B 0%	0 100%	N 100%	A 27%	0 17%
B1 0%	F 0%	S 0%	1 45%	1 42%	R 93%	1 0%	S 0%	B 73%	1 83%
B2 0%	C 0%	L 0%	2 2%	2 12%	G 2%	2 0%	M 0%	C 0%	2 0%
E1 0%	M 0%	S&L 0%	x 0.5	3 0%	NO 2%	x 0.0	G 0%	D 0%	3 0%
E2 0%	P 0%	I 0%		4 0%	E 3%		U 0%	E 0%	x 0.8
H1 2%	OT 0%	OT 0%		x 0.7	OT 0%		OT 0%	F 0%	
H2 0%								OT 0%	
M1 0%									
M2 0%									
OT 2%									
Summary of Normals									
97%	100%	100%	53%		95%	100%	100%	100%	
Summary of Means									
			0.5	0.7		0.0			0.8

SEX: M: 45% F: 55% u: 0%

GENERAL REMARKS

FINS Eroded caudal on #30 and #47

SKIN Eroded opercle on #15

GONADS NA

OTHER Station,#l-30 63 44/11,13R6--Barge,#31-60 63 44/7,8R6

Appendix H.

Qual.Qual. Control N709 86-8A

SN	LGH	WGT	Ktl	EYE	GILL	PSBR	THY	FAT	SPL	GUT	KID	LIV	BILE	SEX	HEM	LEU	SPR
1	205	73.1	0.8	N	N	N	1	1	R	0	N	B	1	F	44	1.0	5.2
2	195	68.5	0.9	N	N	N	1	0	R	0	N	A	1	F	45	1.0	4.3
3	177	49.3	0.9	N	N	N	0	0	R	0	N	B	1	F	40	1.0	4.2
4	197	65	0.9	N	N	N	1	0	R	0	N	A	1	F	43	1.0	4.6
5	207	76.1	0.9	N	N	N	1	0	R	0	N	A	1	M	50	1.0	4.4
6	197	63.7	0.8	N	N	N	1	0	R	0	N	B	1	M	39	1.0	3.9
7	180	53.7	0.9	N	N	N	0	1	R	0	N	B	0	F	43	1.0	4.8
8	180	48.9	0.8	N	N	N	0	0	R	0	N	B	1	F	50	1.0	4.2
9	190	57.5	0.8	N	N	N	0	0	R	0	N	B	1	F	42	1.0	3.8
10	208	72.9	0.8	N	N	N	0	0	R	0	N	B	1	F	47	1.0	5.0
11	147	28.6	0.9	N	N	N	1	0	R	0	N	B	1	M	46	0.0	4.5
12	180	56	1.0	N	N	N	1	2	NO	0	N	B	1	M	46	1.0	2.8
13	197	68.3	0.9	N	N	N	1	1	R	0	N	B	1	F	39	1.0	5.4
14	182	51	0.8	N	N	N	1	1	R	0	N	B	1	M	40	1.0	4.7
15	187	55.7	0.9	N	N	N	0	1	R	0	N	B	1	F	41	1.0	4.1
16	192	59.9	0.8	N	N	N	0	0	R	0	N	B	1	M	42	1.0	4.2
17	206	79.1	0.9	N	N	N	1	2	R	0	N	B	1	F	39	1.0	5.7
18	200	66.8	0.8	N	N	N	1	1	R	0	N	B	1	F	38	2:0	5.3
19	190	68.6	1.0	N	N	N	0	2	E	0	N	B	1	M	43	1.0	4.5
20	190	57.7	0.8	N	N	N	1	1	R	0	N	B	1	M	37	0.0	4.8
21	179	47.1	0.8	N	N	N	2	1	R	0	N	B	1	M	47	1.0	5.1
22	203	75.3	0.9	N	N	N	0	0	E	0	N	A	1	M	45	1.0	4.8
23	195	60.5	0.8	N	N	N	1	0	R	0	N	B	1	F	43	1.0	4.7
24	185	55.5	0.9	N	N	N	0	1	R	0	N	B	1	M	36	1.0	4.4
25	203	66.6	0.8	N	N	N	1	1	R	0	N	B	1	F	40	0.0	4.9
26	184	52.3	0.8	N	N	N	0	2	R	0	N	B	1	F	39	1.0	4.4
27	205	73.6	0.9	N	N	N	0	1	R	0	N	B	1	M	41	1.0	4.6
28	176	43	0.8	N	N	N	1	2	R	0	N	B	1	M	44	1.0	5.0
29	176	53.9	1.0	N	N	N	0	2	R	0	N	B	1	M	47	1.0	6.1
30	182	56.6	0.9	N	N	N	0	1	R	0	N	A	1	F	45	1.0	1.8
31	178	51	0.9	N	N	N	1	2	G	0	N	B	1	F	39	0.0	4.9
32	190	57.5	0.8	N	N	N	0	1	R	0	N	B	1	F	43	1.0	5.3
33	173	41.3	0.8	N	N	N	0	0	R		N	B		F	37	1.0	4.7
34	198	69.8	0.9	N	N	N	0	0	R	8	N	B	8	F	44	1.0	5.5
35	176	48.4	0.9	N	N	N	0	0	R		N	B	1	F	48	1.0	5.3
36	188	55.2	0.8	N	N	N	0	0	R	8	N	A	1	F	45	0.0	4.8
37	192	59.9	0.8	N	N	N	0	1	R		N	A	1	M	38	1.0	4.2
38	187	53.4	0.8	N	N	N	0	0	R	8	N	B		F	36	1.0	3.7
39	169	40	0.8	N	N	N	1	0	R		N	B		F	40	1.0	4.2
40	188	53.9	0.8	N	N	N	0	1	R	8	N	B	I	F	41	1.0	5.0
41	206	77	0.9	N	N	N	1		R		N	B	1	F	33	1.0	4.2
42	196	67.8	0.9	N	N	N	1	8	R	8	N	B	1	M	40	0.0	4.0
43	199	67	0.9	N	N	N	1		R		N	B	0	F	44	1.0	5.1
44	213	83.3	0.9	OT	N	N	0	8	R	8	N	B	1	F	42	1.0	3.9
45	191	60.6	0.9	N	N	N	1	1	R		N	A	1	F	40	1.0	5.2
46	205	73.6	0.9	N	N	N	1	0	R	8	N	A	1	M	39	1.0	3.5
47	190	61.9	0.9	N	N	N	0	1	R		N	B	1	M	42	1.0	2.5
48	186	49.6	0.8	N	N	N	0	0	R	8	N	A	0	F	46	1.0	3.5
49	188	57.5	0.9	N	N	N	1	0	R		N	B	0	M	43	1.0	5.0
50	169	43.4	0.9	N	N	N	0	1	R	8	N	B	1	F	48	0.0	5.4
51	197	62.2	0.8	N	N	N	0	0	R		N	A	1	M	42	1	5.4
52	131	20.6	0.9	N	N	N	0	1	R	8	N	A	1	M	47	0	6.1
53	207	75.5	0.9	N	N	N	0	1	R	0	N	A	1	M	38	1	4.0
54	186	57.6	0.9	N	N	N	1	0	R	0	N	B	0	M	38	1	4.5
55	198	65.1	0.8	N	N	N	0	1	R		N	B	1	M	42	1	5.0
56	188	57.4	0.9	H1	N	N	1	1	R	8	N	B	1	M	45	1	4.3
57	203	73.1	0.9	N	N	N	0	1	R	0	N	B	1	M	41	1	5.0
58	207	78.6	0.9	N	N	N	1	1	R	0	N	A	1	F	47	1	4.9
59	204	69.4	0.8	N	N	N	0	0	R	0	N	A	1	F	47	1	4.1
60	199	69.8	0.9	N	N	N	1	1	R	0	N	A	1	M	44	1	5.6

Appendix H.

SUMMARY OF FISH AUTOPSY

LOCATION: Lyons Ferry QUAL. CONTROL INSPECT. NO.: 709

Species: Chinook
Strain: Falls
Mark/Lot: See gen. remarks
Unit: Pd 21-22
Fish Source: Lyons
Egg Source: Lyons
Hatching Date: NA

Autopsy Date: 04/06/88
Age: BY 86
Water Temp.. 53 F
Water Hardness: NA ppm
Investigator: PM/JC
Reason for Autopsy: Pre-Lib Exam

Sample Size: 30
Tissue Collection No.: NA
Disease Survey No.: NA
Case History No.: 709
Custody No.: NA

Remarks: Yearling release--on station

	MEAN	STANDARD DEVIATION	COEFFICIENT OF VARIATION
Length	189.830 mm	12.89 mm	7%
Weight	60.160 gr	11.1 gr	18%
Ktl*	0.880	0.05	6%
Ctl**	3.179		
Hematocrit	42.700	3.59	8%
Leucocrit	0.930	0.36	39%
Serum Protein	4.540	0.79	17%

*Expressed as Ktl times 10 to the fifth power
**Converted from Ktl; expressed as Ctl times 10 to the fourth power

VALUES AS PERCENT OF TOTAL SAMPLE

EYES	GILLS	PSEUDO-BRANCHS	THYMUS	MESEN. FAT	SPLEEN	HIND GUT	KIDNEY	LIVER	BILE
N 100%	N 100%	N 100%	0 47%	0 40%	B 0%	0 100%	N 100%	A 17%	0 3%
B1 0%	F 0%	S 0%	1 50%	1 40%	R 90%	1 0%	S 0%	B 83%	1 97%
B2 0%	C 0%	L 0%	2 3%	2 20%	G 0%	2 0%	G 0%	C 0%	2 0%
E1 0%	M 0%	S&L 0%	x 0.6	0%	NO 3%	x 0.0	U 0%	D 0%	3 0%
E2 0%	P 0%	I 0%		2 0%	E 7%		0%	E 0%	x 1.0
H1 0%	OT 0%	OT 0%		x 0.8	OT 0%		OT 0%	F 0%	
H2 0%								OT 0%	
M1 0%									
M2 0%									
OT 0%									

Summary of Normals

100%	100%	100%	47%	90%	100%	100%	100%

Summary of Means

		0.6	0.8	0.0			1.0

SEX: M: 47% F: 53% u: 0%

GENERAL REMARKS

FINS Eroded caudal on #30

SKIN Eroded opercle on #15

GONADS NA

OTHER Station release #1-30, CWT 63 44/1 ,13R6

Appendix H.

Qual.Qual. Control N709 86-8A

SN	LGH	WGT	Ktl	EYE	GILL	PSBR	THY	FAT	SPL	GUT	KID	LIV	BILE	SEX	HEM	LEU	SPR
1	205	73.1	0.8	N	N	N	1	0	R	0	N	B	1	F	44	1.0	5.2
2	195	68.5	0.9	N	N	N	1	0	R	0	N	A	1	F	45	1.0	4.3
3	177	49.3	0.9	N	N	N	0	0	R	0	N	B	1	F	40	1.0	4.2
4	197	65	0.9	N	N	N	1	0	R	0	N	A	1	F	43	1.0	4.6
5	207	76.1	0.9	N	N	N	1		R	0	N	A	1	M	50	1.0	4.4
6	197	63.7	0.8	N	N	N	1	0	R	0	N	B	1	M	39	1.0	3.9
7	180	53.7	0.9	N	N	N	0	1	R	0	N	B	0	F	43	1.0	4.8
8	180	48.9	0.8	N	N	N	0	0	R	0	N	B	1	F	50	1.0	4.2
9	190	57.5	0.8	N	N	N	0	0	R	0	N	B	1	F	42	1.0	3.8
10	208	72.9	0.8	N	N	N	0	0	R	0	N	B	1	F	47	1.0	5.0
11	147	28.6	0.9	N	N	N	1	0	R	0	N	B	1	M	46	0.0	4.5
12	180	56	1.0	N	N	N	1	2	NO	0	N	B	1	M	46	1.0	2.8
13	197	68.3	0.9	N	N	N	1	1	R	0	N	B	1	F	39	1.0	5.4
14	182	51	0.8	N	N	N	1	1	R	0	N	B	1	M	40	1.0	4.7
15	187	55.7	0.9	N	N	N	0		R	0	N	B	1	F	41	1.0	4.1
16	192	59.9	0.8	N	N	N	0	0	R	0	N	B	1	M	42	1.0	4.2
17	206	79.1	0.9	N	N	N	1	1	R	0	N	B	1	F	39	1.0	5.7
18	200	66.8	0.8	N	N	N	1	2	R	0	N	B	1	F	38	2.0	5.3
19	190	68.6	1.0	N	N	N	0	1	E	0	N	B	1	M	43	1.0	4.5
20	190	57.7	0.8	N	N	N	1	1	R	0	N	B	1	M	37	0.0	4.8
21	179	47.1	0.8	N	N	N	2			0	N	B	1	M	47	1.0	5.1
22	203	75.3	0.9	N	N	N	0		E	0	N	A	1	M	45	1.0	4.8
23	195	60.5	0.8	N	N	N	1	8	R	0	N	B	1	F	43	1.0	4.7
24	185	55.5	0.9	N	N	N	0	1	R	0	N	B	1	M	36	1.0	4.4
25	203	66.6	0.8	N	N	N	1	1	R	0	N	B	1	F	40	0.0	4.9
26	184	52.3	0.8	N	N	N	0	2	R	0	N	B	1	F	39	1.0	4.4
27	205	73.6	0.9	N	N	N	0	1	R	0	N	B	1	M	41	1.0	4.6
28	176	43	0.8	N	N	N	1	2	R	0	N	B	1	M	44	1.0	5.0
29	176	53.9	1.0	N	N	N	0	2	R	0	N	B	1	M	47	1.0	6.1
30	182	56.6	0.9	N	N	N	0	1	R	0	N	A	1	F	45	1.0	1.8
31																	
32																	
33																	
34																	
35																	
36																	
37																	
38																	
39																	
40																	
41																	
42																	
43																	
44																	
45																	
46																	
47																	
48																	
49																	
50																	
51																	
52																	
53																	
54																	
55																	
56																	
57																	
58																	
59																	
60																	

Appendix H.

SUMMARY OF FISH AUTOPSY

LOCATION: Lyons Ferry QUAL. CONTROL INSPECT. NO.: 709

Species: Chinook
Strain: Falls
Mark/Lot: See gen. remarks
Unit: Pd 23-28,30
Fish Source: Lyons
Egg Source: Lyons
Hatching Date: NA

Autopsy Date: 04/06/88
Age: BY 86
Water Temp.: 53 F
Water Hardness: NA ppm
Investigator: PM/JC
Reason for Autopsy: Pre-Lib Exam

Sample Size: 30
Tissue Collection No.: NA
Disease Survey No.: NA
Case History No.: 709
Custody No.: NA

Remarks: Yearling release--Barge

	MEAN	STANDARD DEVIATION	COEFFICIENT OF VARIATION
Length	190.070 mm	15.69 mm	8%
Weight	60.050 gr	13.2 gr	22%
Ktl*	0.870	NA	NA
Ctl**	3: 143		
Hematocrit	41.970	3.73	9%
Leucocrit	0.830	0.37	45%
Serum Protein	4.630	0.76	16%

*Expressed as Ktl times 10 to the fifth power
**Converted from Ktl; expressed as Ctl times 10 to the fourth power

VALUES AS PERCENT OF TOTAL SAMPLE

EYES	GILLS	PSEUDO-BRANCHS	THYMUS	MESEN. FAT	SPLEEN	HIND GUT	KIDNEY	LIVER	BILE
N 93%	N 100%	N 100%	0 60%	0 53%	B	0 100%	N 100%	A 37%	0 30%
B1 0%	F 0%	S 0%	1 40%	1 43%	R 9%	1 0%	S 0%	B 63%	1 70%
B2 0%	C 0%	L 0%	2 0%	2 3%	G 3%	2 0%	M 0%	C 0%	2 0%
E1 0%	M 0%	S&L	x 0.4	3 0%	NO 0%	x 0.0	G 0%	D 0%	3 0%
E2 0%	P 0%	I 8%		4 0%	E 0%		U 0%	E 0%	x 0.7
H1 3%	OT 0%	OT 0%		x 0.5	OT 0%		OT 0%	F 0%	
H2 0%								OT 0%	
M1 0%									
M2 0%									
OT 3%									
Summary of Normals									
93%	100%	100%	60%		100%	100%	100%	100%	
Summary of Means									
			0.4	0.5		0.0			0.7

SEX: M: 43% F: 57% u: 0%

GENERAL REMARKS

FINS Eroded caudal on #47

SKIN NA

GONADS NA

OTHER Barge release #31-60, CWT 63 44/7,8R6

Appendix H.

Qual.Qual. Control N709 86-8A

SN	LGH	WGT	Ktl	EYE	GILL	PSBR	THY	FAT	SPL	GUT	KID	LIV	BILE	SEX	HEM	LEU	SPR
1			ERR														
2			ERR														
3			ERR														
4			ERR														
5			ERR														
6			ERR														
7			ERR														
8			ERR														
9			ERR														
10			ERR														
11			ERR														
12			ERR														
13			ERR														
14			ERR														
15			ERR														
16			ERR														
17			ERR														
18			ERR														
19			ERR														
20			ERR														
21			ERR														
22			ERR														
23			ERR														
24			ERR														
25			ERR														
26			ERR														
27			ERR														
28			ERR														
29			ERR														
30			ERR														
31	178	51	0.9	N	N	N	1	2	G	0	N	B	1	F	39	0.0	4.9
32	190	57.5	0.8	N	N	N		1	R	0	N	B	1	F	43	1.0	5.3
33	173	41.3	0.8	N	N	N	8	0	R	0	N	B	0	F	37	1.0	4.7
34	198	69.8	0.9	N	N	N		0	R	0	N	B	0	F	44	1.0	5.5
35	176	48.4	0.9	N	N	N	8	0	R	0	N	B	1	F	48	1.0	5.3
36	188	55.2	0.8	N	N	N	0	0	R	0	N	A	1	F	45	0.0	4.8
37	192	59.9	0.8	N	N	N	0	1	R	0	N	A	1	M	38	1.0	4.2
38	187	53.4	0.8	N	N	N	0	0	R	0	N	B	0	F	36	1.0	3.7
39	169	40	0.8	N	N	N	1	0	R	0	N	B	0	F	40	1.0	4.2
40	188	53.9	0.8	N	N	N	0	1	R	0	N	B	0	F	41	1.0	5.0
41	206	77	0.9	N	N	N	1	0	R	0	N	B	1	F	33	1.0	4.2
42	196	67.8	0.9	N	N	N	1	0	R	0	N	B	1	M	40	0.0	4.0
43	199	67	0.9	N	N	N	1	0	R	0	N	B	0	F	44	1.0	5.1
44	213	83.3	0.9	OT	N	N	0	0	R	0	N	B	1	F	42	1.0	3.9
45	1			N	N	N	1	1	R	0	N	A	1	F	40	1.0	5.2
46	205	70.6	0.9	N	N	N	1	0	R	0	N	A	1	M	39	1.0	3.5
47	190	61.9	0.9	N	N	N	0	1	R	0	N	B	1	M	42	1.0	2.5
48	186	49.6	0.8	N	N	N	0	0	R	0	N	A	0	F	46	1.0	3.5
49	188	57.5	0.9	N	N	N	1	0	R	0	N	B	0	M	43	1.0	5.0
50	169	43.4	0.9	N	N	N	0	1	R	0	N	B	1	F	48	0.0	5.4
51	197	62.2	0.8	N	N	N	0	0	R	0	N	A	1	M	42	1.0	5.4
52	131	20.6	0.9	N	N	N	0	1	R	0	N	A	1	M	47	0.0	6.1
53	207	75.5	0.9	N	N	N	0	1	R	0	N	A	1	M	38	1.0	4.0
54	186	57.6	0.9	N	N	N	1	0	R	0	N	B	0	M	38	1.0	4.5
55	198	65.1	0.8	N	N	N	0	1	R	0	N	B	1	M	42	1.0	5.0
56	188	57.4	0.9	H1	N	N	1	1	R	0	N	B	1	M	45	1.0	4.3
57	203	73.1	0.9	N	N	N	0	1	R	0	N	B	1	M	41	1.0	5.0
58	207	78.6	0.9	N	N	N	1	1	R	0	N	A	1	F	47	1.0	4.9
59	204	69.4	0.8	N	N	N	0	0	R	0	N	A	1	F	47	1.0	4.1
60	199	69.8	0.9	N	N	N	1	1	R	0	N	A	1	M	44	1.0	5.6

Appendix H.

SUMMARY OF FISH AUTOPSY

LOCATION: Cowlitz QUAL. CONTROL INSPECT. NO.: 719

Species: Chinook
Strain: Springs
Mark/Lot: NA
Unit: See gen. remarks
Fish Source: Cowlitz
Egg Source: Cowlitz
Hatching Date: NA

Autopsy Date: 04/19/88
Age: BY 87
Water Temp.: 46 F
Water Hardness: NA ppm
Investigator: PM/BR/JC
Reason for Autopsy: Pre-lib Exam

Sample Size: 60
Tissue Collection No.: 719
Disease Survey No.: 719
Case History No.: 719
Custody No.: 719

Remarks: Normal release zeros

	MEAN	STANDARD DEVIATION	COEFFICIENT OF VARIATION
Length	85.230 mm	6.18 mm	7%
Weight	5.590 gr	1.42 gr	25%
Ktl*	0.900	0.05	6%
Ctl**	3.252		
Hematocrit	38.440	3.05	8%
Leucocrit	0.080	0.27	333%
Serum Protein	5.580	1.37	25%

*Expressed as Ktl times 10 to the fifth power
**Converted from Ktl; expressed as Ctl times 10 to the fourth power

VALUES AS PERCENT OF TOTAL SAMPLE

EYES	GILLS	PSEUDO-BRANCHS	THYMUS	MESEN. FAT	SPLEEN	HIND GUT	KIDNEY	LIVER	BILE
N 100%	N 100%	N 98%	0 97%	0 17%	B 0%	0 100%	N 100%	A 18%	0 75%
B1 0%	F 0%	S 2%	1 3%	1 68%	R 98%	1 0%	S 0%	B 82%	1 25%
B2 0%	C 0%	L 0%	2 0%	2 15%	G 0%	2 0%	M 0%	C 0%	2 0%
E1 0%	M 0%	S&L 0%	x 0.0	3 0%	NO 0%	x 0.0	G 0%	D 0%	3 0%
E2 0%	P 0%	I 0%		4 0%	E 2%		U 0%	E 0%	x 0.3
H1 0%	OT 0%	OT 0%		x 1.0	OT 0%		OT 0%	F 0%	
H2 0%								OT 0%	
M1 0%									
M2 0%									
OT 0%									

Summary of Normals

100%	100%	98%	97%		98%	100%	100%	100%

Summary of Means

			0.0	1.0		0.0		0.3

SEX: M: 57% F: 43% u: 0%

GENERAL REMARKS

FINS NA

SKIN NA

GONADS NA

OTHER Sample#l-20, ponds 8&17--#21-60, ponds 9,12,14,15

Appendix H.

Qual.Qual. Control N719 86-8A

SN	LGH	WGT	Ktl	EYE	GILL	PSBR	THY	FAT	SPL	GUT	KID	LIV	BILE	SEX	HEM	LEU	SPR
1	89	6.3	0.9	N	N	N	0	0	R	0	N	B	0	M	38	0.0	6.5
2	102	10.4	1.0	N	N	N	0	1	R	0	N	B	0	M	36	0.0	5.6
3	87	5.8	0.9	N	N	N	0	1	R	0	N	B	0	F	40	0.0	5.8
4	87	6.1	0.9	N	N	N	1	1	R	0	N	B	0	F	35	0.0	6.3
5	92	6.7	0.9	N	N	N	0	1	R	0	N	B	0	F	46	0.0	6.4
6	82	4.5	0.8	N	N	N	0	0	R	0	N	B	0	M	45	0.0	4.4
7	79	4.1	0.8	N	N	N	0	1	R	0	N	B	1	F	42	0.0	6.1
8	88	6.1	0.9	N	N	N	0	1	R	0	N	B	0	F	44	0.0	5.5
9	86	5.6	0.9	N	N	N	0	0	R	0	N	A	0	M			6.0
10	87	5.7	0.9	N	N	N	0	1	R	0	N	A	0	F	45	0.0	7.5
11	92	7.6	1.0	N	N	N	0	1	R	0	N	B	0	M	40	0.0	7.6
12	92	7.4	1.0	N	N	N	0	1	R	0	N	B	0	M	39	0.0	5.5
13	94	7.8	0.9	N	N	N	0	1	R	0	N	B	1	M	40	0.0	8.5
14	99	8.5	0.9	N	N	N	0	2	R	0	N	B	0	M	38	0.0	5.3
15	93	6.7	0.8	N	N	N	0	1	E	0	N	B	0	F	40	0.0	5.0
16	97	8.6	0.9	N	N	N	0	1	R	0	N	B	0	M	41	0.0	6.1
17	87	5.8	0.9	N	N	N	0	1	R	0	N	B	0	M	37	0.0	6.8
18	90	6.2	0.9	N	N	N	0	1	R	0	N	B	0	F	37	0.0	5.0
19	88	6.7	1.0	N	N	N	0	2	R	0	N	B	0	M	35	0.0	5.2
20	87	5.7	0.9	N	N	N	0	1	R	0	N	B	0	M	37	0.0	5.5
21	83	5.5	1.0	N	N	N	0	1	R	0	N	B	0	F	35	0.0	6.2
22	94	7.5	0.9	N	N	N	0	1	R	0	N	B	0	F	40	1.0	6.9
23	80	3.9	0.8	N	N	N	0	1	R	0	N	B	0	F	40	0.0	5.2
24	84	5.2	0.9	N	N	N	0	1	R	0	N	B	0	M	40	0.0	5.3
25	82	5.2	0.9	N	N	N	0	2	R		N	B	0	M	39	0.0	7.0
26	86	5.2	0.8	N	N	N	0	1	R	8	N	B	0	F	39	1.0	5.0
27	79	4	0.8	N	N	N	0	0	R		N	B	1	M			4.5
28	82	4.3	0.8	N	N	N	0	1	R	8	N	B	1	M	38	0.0	5.0
29	83	5.3	0.9	N	N	N	0	2	R		N	B	0	F	35	0.0	4.9
30	81	4.7	0.9	N	N	N	0	1	R	8	N	B	0	M	37	0.0	6.0
31	83	5.3	0.9	N	N	N	0	1	R	0	N	B	1	M	37	0.0	5.7
32	92	6.7	0.9	N	N	N	0	1	R	0	N	B	1	M	40	0.0	6.8
33	79	4.3	0.9	N	N	N	0	1	R	0	N	B	0	M	39	0.0	5.9
34	79	4.2	0.9	N	N	N	0	1	R	0	N	B	0	M	36	0.0	4.8
35	85	5.4	0.9	N	N	N	0	0	R	0	N	A	1	M	37	0.0	5.6
36	78	4.2	0.9	N	N	S	0	1	R	0	N	B	0	M	39	0.0	5.6
37	72	3.2	0.9	N	N	N	0	1	R	0	N	A	0	M			4.6
38	80	4.4	0.9	N	N	N	0	1	R		N	B	0	M	38	0.0	5.7
39	73	3.1	0.8	N	N	N	0	1	R	8	N	B	0	F	34	0.0	3.8
40	78	3.8	0.8	N	N	N	0	1	R		N	B	1	F			4.8
41	86	6.1	1.0	N	N	N	0	2	R	8	N	B	0	F	33	0.0	6.3
42	89	6.3	0.9	N	N	N	0	1	R	0	N	B	1	M	36	0.0	6.1
43	80	4.3	0.8	N	N	N	0	1	R	0	N	B	0	F	37	0.0	5.4
44	79	4.4	0.9	N	N	N	0	0	R	0	N	B	0	M			5.4
45	79	4.5	0.9	N	N	N	0	1	R	0	N	B	0	M	37	0.0	5.9
46	79	4.5	0.9	N	N	N	1	0	R	0	N	B	0	F	34	0.0	6.0
47	84	5.5	0.9	N	N	N	0	1	R	0	N	B	0	F	38	0.0	6.0
48	80	4.4	0.9	N	N	N	0	0	R	0	N	B	0	M	36	1.0	5.8
$9	83	5.1	0.9	N	N	N	0	1	R	0	N	B	0	F	32	0.0	6.2
50	76	3.8	0.9	N	N	N	0	0	R		N	B	0	M			4.1
51	91	7	0.9	N	N	N	0	2	R	8	N	A	0	M	40	0	6.5
52	85	5.4	0.9	N	N	N	0	1	R	0	N	B	1	F	43	0	6.4
53	92	7	0.9	N	N	N	0	1	R	0	N	A	1	M	39	0	7.6
34	87	6.1	0.9	N	N	N		2	R	0	N	A	1	F	44	0	6.0
55	85	5.6	0.9	N	N	N	8	1	R	0	N	A	1	F	38	0	7.0
56	93	7.6	0.9	N	N	N		2	R	0	N	B	0	F	36	0	5.8
57	86	5.1	0.8	N	N	N	8	0	R	0	N	A	0	M	41	1	5.6
58	81	4.5	0.8	N	N	N	0	1	R	0	N	B	1	F			5.6
59	78	4.2	0.9	N	N	N	0	1	R	0	N	A	1	M			3.6
60	90	6.5	0.9	N	N	N	0	2	R	0	N	A	0	F	37	0	6.4

Appendix H.

SUMMARY OF FISH AUTOPSY

LOCATION: Lewis River QUAL. CONTROL INSPECT. NO.: 720

Species: Coho
Strain: Early & Late
Mark/Lot: 63 44/50 R3
Unit: NA
Fish Source: Speelyai
Egg Source: Lewis
Hatching Date: NA

Autopsy Date: 04-20-88
Age: BY 86
Water Temp.. 45 F
Water Hardness: NA ppm
Investigator: PM/BR/NM
Reason for Autopsy: Pre-lib Exam

Sample Size: 60
Tissue Collection No.: 720
Disease Survey No.: 720
Case History No.: 720
Custody No.: 720

Remarks: Early and late yearlings combined. Early group CWT

	MEAN	STANDARD DEVIATION	COEFFICIENT OF VARIATION
Length	135.550 mm	10.65 mm	8%
Weight	21.810 gr	5.39 gr	[illegible]
Ktl*	0.880	0.06	25%
Ctl**	3.179		7%
Hematocrit	32.870	4.31	13%
Leucocrit	0.550	0.76	139%
Serum Protein	4.230	1.04	24%

*Expressed as Ktl times 10 to the fifth power
**Converted from Ktl; expressed as Ctl times 10 to the fourth power

VALUES AS PERCENT OF TOTAL SAMPLE

EYES	GILLS	PSEUDO-BRANCHS	THYMUS	MESEN. FAT	SPLEEN	HIND GUT	KIDNEY	LIVER	BILE
N 97%	N 100%	N 100%	0 97%	0 0%	B 15%	0 100%	N 100%	A 75%	0 43%
B1 2%	F 0%	S 0%	1 3%	1 25%	R 73%	1 0%	S 0%	B 25%	1 28%
B2 0%	C 0%	L 0%	2 0%	2 58%	G 3%	2 0%	M 0%	C 0%	2 22%
E1 0%	M 0%	S&L 0%	x 0.0	3 15%	NO 0%	x 0.0	G 0%	D 0%	3 7%
E2 0%	P 0%	I 0%		4 2%	E 8%		U 0%	E 0%	x 0.9
H1 0%	OT 0%	OT 0%		x 1.9	OT 0%		OT 0%	F 0%	
H2 0%								OT 0%	
M1 0%									
M2 0%									
OT 2%									

Summary of Normals

97%	100%	100%	97%		92%	100%	100%	100%

Summary of Means

			0.0	1.9		0.0		0.9

SEX: M: 40% F: 60% U: 0%

GENERAL REMARKS

FINS NA

SKIN NA

GONADS NA

OTHER Pink fat in two fish. Frayed fins, two fish.

Appendix H.

Qual.Qual. Control N720 86-8A

SN	LGH	WGT	Ktl	EYE	GILL	PSBR	THY	FAT	SPL	GUT	KID	LIV	BILE	SEX	HEM	LEU	SPR
1	144	23.3	0.8	N	N	N	0	1	R	0	N	A	0	F	32	0.0	4.6
2	135	21.4	0.9	N	N	N	0	1	R	0	N	B	0	F	31	0.0	2.4
3	133	22.1	0.9	N	N	N	0	2	R	0	N	B	0	M	38	0.0	3.6
4	130	19.6	0.9	N	N	N	0	1	R	0	N	B	0	M	28	0.0	4.1
5	143	26.2	0.9	N	N	N	0	2	G	0	N	A	0	F	37	1.0	5.0
6	129	19	0.9	N	N	N	0	2	R	0	N	A	1	F	38	0.0	5.1
7	138	22.3	0.8	N	N	N	0	2	R	0	N	A	1	F	44	0.0	5.0
8	157	34.9	0.9	N	N	N	0	2	B	0	N	A	2	F	29	1.0	5.5
9	142	26.3	0.9	N	N	N	0	2	R	0	N	A	0	F	33	1.0	5.2
10	123	14.3	0.8	N	N	N	0	1	R	0	N	A	2	F	28	0.0	3.6
11	139	18.9	0.7	B1	N	N	0	1	R	0	N	A	1	F	32	0.0	4.3
12	136	19.7	0.8	N	N	N	0	1	R	0	N	A	0	F	31	0.0	3.2
13	123	16.2	0.9	N	N	N	0	1	R	0	N	B	0	F	31	0.0	3.7
14	136	23.8	0.9	N	N	N	1	2	R	0	N	A	0	F	36	0.0	5.0
15	130	20.8	0.9	OT	N	N	0	2	B	0	N	B	2	M	25	0.0	3.6
16	115	13.2	0.9	N	N	N	0	2	R	0	N	A	0	M	35	0.0	4.3
17	137	21.8	0.8	N	N	N	0	2	R	0	N	A	1	M	36	1.0	4.2
18	129	16.6	0.8	N	N	N	0	2	R	0	N	A	1	F	33	1.0	3.2
19	133	19.8	0.8	N	N	N	0	3	R	0	N	A	0	F	34	2.0	4.5
20	111	10.9	0.8	N	N	N	0	1	R	0	N	A	1	F	35	0.0	2.3
21	137	24.8	1.0	N	N	N	0	3	R	0	N	B	0	F	31	0.0	5.1
22	137	22.8	0.9	N	N	N	0	2	B	0	N	B	2	M	25	0.0	3.6
23	138	21	0.8	N	N	N	0	2	B	0	N	A	2	M	37	0.0	4.5
24	156	28.6	0.8	N	N	N	0	1	R	0	N	A	0	M	35	2.0	4.5
25	143	24.6	0.8	N	N	N	0	2	R	0	N	A	1	F	36	1.0	5.0
26	149	32.1	1.0	N	N	N	0	3	B	0	N	B	2	F	30	0.0	4.6
27	132	18.2	0.8	N	N	N	0	1	R	0	N	A	3	M	29	0.0	4.0
28	154	29.4	0.8	N	N	N	0	2	R	0	N	A	1	M	31	2.0	4.3
29	136	20.3	0.8	N	N	N	0	2	R	0	N	A	1	F	35	2.0	4.5
30	129	17.1	0.8	N	N	N	0	1	R	0	N	A	3	F	30	0.0	3.6
31	148	29.8	0.9	N	N	N	0	1	E	0	N	A	2	M	29	0.0	4.0
32	133	21	0.9	N	N	N	0	3	B	0	N	A	2	M	26	0.0	4.2
33	147	31.3	1.0	N	N	N	0	2	R	0	N	B	0	F	34	0.0	4.7
34	133	21.6	0.9	N	N	N	0	2	R	0	N	A	0	F	39	0.0	4.2
35	141	23.8	0.8	N	N	N	0	2	E	0	N	A	2	M	24	0.0	3.8
36	148	27.5	0.8	N	N	N	0	2	B	0	N	A	3	M	31	1.0	4.5
37	109	11.6	0.9	N	N	N	0	2	R	0	N	B	0	F	24	0.0	4.0
38	121	15.1	0.9	N	N	N	0	2	R	0	N	A	0	F	31	2.0	4.4
39	135	18.5	0.8	N	N	N	0	2	R	0	N	A	1	F	37	1.0	4.3
40	129	19.2	0.9	N	N	N	0	3	R	0	N	B	0	M	32	1.0	3.8
41	133	18.9	0.8	N	N	N	0	1	R	0	N	A	1	M	34	0.0	4.4
42	137	21.6	0.8	N	N	N	0	2	R	0	N	A	0	M	35	1.0	5.2
43	131	19.9	0.9	N	N	N	0	2	R	0	N	A	1	M	36	0.0	4.7
44	152	31.8	0.9	N	N	N	0	4	G	0	N	A	1	F	40	0.0	5.6
45	137	23.4	0.9	N	N	N	0	2	R	0	N	A	0	F	33	0.0	5.4
46	142	25.2	0.9	N	N	N	1	1	B	0	N	B	3	M	25	0.0	4.5
47	130	20.2	0.9	N	N	N	0	3	E	0	N	A	0	F	29	0.0	4.5
48	127	18.5	0.9	N	N	N	0	2	R	0	N	A	0	F	31	2.0	4.2
49	139	23.2	0.9	N	N	N	0	3	R	0	N	A	2	M	35	2.0	5.0
50	125	16.1	0.8	N	N	N	0	2	E	0	N	A	2	M	30	1.0	3.8
51	113	11.8	0.8	N	N	N	0	2	R	0	N	A	1	M	36	0	4.2
52	140	23.2	0.8	N	N	N	0	2	R	0	N	A	1	M	40	1	4.9
53	130	18.7	0.9	N	N	N	0	1	R	0	N	A	0	F	35	0	5.0
54	144	26.1	0.9	N	N	N	0	3	R	0	N	A	1	F	38	2	5.3
55	139	22.2	0.8	N	N	N	0	2	R	0	N	A	1	F	35	2	5.1
56	121	15.3	0.9	N	N	N	0	2	R	0	N	B	0	M	33	0	4.8
57	162	36.3	0.9	N	N	N	0	3	R	0	N	A	0	F	39	1	5.3
58	137	23.6	0.9	N	N	N	0	2	B	0	N	B	2	F	27	0	4.3
59	136	20.1	0.8	N	N	N	0	2	R	0	N	A	0	F	36	2	4.0
60	140	23.2	0.8	N	N	N	0	2	E	0	N	B	2	F	33	0	4.3

Appendix H.

SUMMARY OF FISH AUTOPSY

LOCATION: Cowlitz QUAL. CONTROL INSPECT. NO.: 728

Species: Chinook
Strain: Fall
Mark/Lot: NA
Unit: Pds2-5,8-11,13-16
Fish Source: Cowlitz
Egg Source: Cowlitz
Hatching Date: NA

Autopsy Date: 05/17/88
Age: BY 87
Water Temp.: 47 F
Water Hardness: NA ppm
Investigator: BR/PM/JC
Reason for Autopsy: Pre-lib exam

Sample Size: 60
Tissue Collection No.: 728
Disease Survey No.: 728
Case History No.: 728
Custody No.: 728

Remarks: Normal release zeros

	MEAN	STANDARD DEVIATION	COEFFICIENT OF VARIATION
Length	77.020 mm	6.46 mm	8%
Weight	4.230 gr	1.07 gr	25%
Ktl*	0.930	0.06	7%
Ctl**	3.360		
Hematocrit	35.260	3.23	9%
Leucocrit	0.880	0.46	52%
Serum Protein	5.020	0.78	15%

*Expressed as Ktl times 10 to the fifth power
**Converted from Ktl; expressed as Ctl times 10 to the fourth power

VALUES AS PERCENT OF TOTAL SAMPLE

EYES	GILLS	PSEUDO-BRANCHS	THYMUS	MESEN. FAT	SPLEEN	HIND GUT	KIDNEY	LIVER	BILE
N 100%	N 100%	N 100%	0 97%	0 13%	B 0%	0 100%	N 100%	A 58%	0 48%
B1 0%	F 0%	S 0%	1 3%	1 72%	R 98%	1 0%	S 0%	B 42%	1 52%
B2 0%	C 0%	L 0%	2 0%	2 15%	G 0%	2 0%	M 0%	C 0%	2 0%
E1 0%	M 0%	S&L 0%	x 0.0	0%	NO 0%	x 0.0	G 0%	D 0%	3 0%
E2 0%	P 0%	I 0%		2 0%	E 2%		U 0%	E 0%	x 0.5
H1 0%	OT 0%	OT 0%		x 1.0	OT 0%		OT 0%	F 0%	
H2 0%								OT 0%	
M1 0%									
M2 0%									
OT 0%									

Summary of Normals

100%	100%	100%	97%		98%	100%	100%	100%

Summary of Means

		I	0.0	1.0	I	0.0	I I	0.5

SEX: M: 47% F: 47% u: 7%

GENERAL REMARKS

FINS NA

SKIN NA

GONADS NA

OTHER NA

Appendix H.

Qual.Qual. Control N728 86-8A

SN	LGH	WGT	K.tl	EYE	GILL	PSBR	THY	FAT	SPL	GUT	KID	LIV	BILE	SEX	HEM	LEU	SPR
1	86	6	0.9	N	N	N	0	1	R	0	N	B	0	F	39	1.0	5.6
2	59	1.9	0.9	N	N	N	0	1	R	0	N	B	0	F	37	0.0	4.3
3	78	4.2	0.9	N	N	N	0	1	R	0	N	A	1	F	43	1.0	6.0
4	82	4.9	0.9	N	N	N	0	1	R	0	N	A	1	M	39	1.0	4.1
5	80	5	1.0	N	N	N	0	1	R	0	N	B	0	M	44	0.0	4.4
6	76	3.8	0.9	N	N	N	0	1	R	0	N	A	1	F	38	1.0	6.0
7	84	5.5	0.9	N	N	N	0	1	R	0	N	A	0	F	40	1.0	6.0
8	73	3.3	0.8	N	N	N	0	0	R	0	N	B	1	M	40	0.0	5.0
9	77	3.9	0.9	N	N	N	0	1	R	0	N	A	0	F	45	0.0	5.3
10	76	3.7	0.8	N	N	N	0	0	R	0	N	B	0	M	36	0.0	4.2
11	73	3.5	0.9	N	N	N	0	1	R	0	N	A	0	M	33	0.0	5.0
12	81	5.4	1.0	N	N	N	0	2	R	0	N	A	0	F	34	1.0	5.6
13	68	2.8	0.9	N	N	N	0	1	R	0	N	A	1	U			5.8
14	82	4.8	0.9	N	N	N	0	0	R	0	N	A	0	M	36	1.0	5.6
15	88	6.9	1.0	N	N	N	0	1	R	0	N	A	0	M	33	2.0	5.2
16	79	4.6	0.9	N	N	N	0	0	R	0	N	A	1	M	37	1.0	5.0
17	81	4.7	0.9	N	N	N	0	1	R	0	N	A	1	M	38	1.0	3.8
18	67	3	1.0	N	N	N	0	1	R	0	N	A	1	M	31	1.0	4.4
19	84	5.4	0.9	N	N	N	0	1	R	0	N	A	1	F	34	1.0	5.0
20	74	3.8	0.9	N	N	N	0	2	R	0	N	A	0	M	34	1.0	3.8
21	83	5.2	0.9	N	N	N	0	1	R	0	N	A	1	M	34	1.0	4.5
22	84	5.8	1.0	N	N	N	0	2	R	0	N	A	0	M	35	1.0	5.3
23	77	3.9	0.9	N	N	N	0	2	R	0	N	A	1	F	29	0.0	4.0
24	66	2.4	0.8	N	N	N	0	1	R	0	N	B	1	F			4.4
25	75	3.5	0.8	N	N	N	0	1	R	0	N	A	1	F	33	1.0	5.8
26	80	4.7	0.9	N	N	N	0	2	R	0	N	A	1	M	33	1.0	4.6
27	76	3.7	0.8	N	N	N	0	0	R	0	N	B	1	F	35	1.0	3.8
28	86	4.6	0.7	N	N	N	0	1	R	0	N	A	0	M	31	1.0	4.6
29	85	5.4	0.9	N	N	N	0	1	R	0	N	A	0	F	39	1.0	5.2
30	77	4.1	0.9	N	N	N	0	1	R	0	N	A	1	F	33	2.0	5.0
31	79	4.3	0.9	N	N	N	0	1	R	0	N	B	1	M	37	1.0	5.2
32	87	6.3	1.0	N	N	N	1	1	R	0	N	A	0	M	37	0.0	4.7
33	78	4.2	0.9	N	N	N	0	2	R	0	N	B	1	M	37	1.0	5.2
34	76	4	0.9	N	N	N	0	1	R	0	N	B	0	F	34	1.0	5.2
35	73	3.4	0.9	N	N	N	0	0	R	0	N	B	0	F	35	1.0	4.5
36	62	2.1	0.9	N	N	N	0	0	R	0	N	B	1	M	29	0.0	2.3
37	65	2.7	1.0	N	N	N	0	2	R	0	N	A	0	F	34	1.0	4.6
38	62	1.9	0.8	N	N	N	0	1	R	0	N	A	0	U	35	1.0	4.2
39	74	3.6	0.9	N	N	N	0	1	R	0	N	A	0	F	34	1.0	5.9
40	75	3.3	0.8	N	N	N	0	1	R	0	N	B	0	U	32	1.0	3.7
41	84	5.3	0.9	N	N	N	0	1	E	0	N	A	0	M	38	1.0	4.7
42	78	4.4	0.9	N	N	N	0	1	R	0	N	A	1	M	36	1.0	6.1
43	74	3.8	0.9	N	N	N	0	1	R	0	N	B	1	M	33	1.0	5.3
44	78	4.5	0.9	N	N	N	0	1	R	0	N	A	0	M	34	1.0	5.2
45	75	3.7	0.9	N	N	N	0	1	R	0	N	B	1	F	35	1.0	5.2
46	84	5.4	0.9	N	N	N	0	1	R	0	N	A	1	M	35	1.0	6.0
47	77	4	0.9	N	N	N	1	1	R	0	N	A	0	F	36	1.0	4.6
48	77	4	0.9	N	N	N	0	1	R	0	N	B	1	M	28	1.0	4.8
49	81	4.7	0.9	N	N	N	0	1	R	0	N	A	1	F	35	1.0	6.2
50	71	3.6	1.0	N	N	N	0	2	R	0	N	B	0	M	33	1.0	6.3
51	83	4.9	0.9	N	N	N	0	1	R	0	N	B	0	F	33	2	5.3
52	85	5.8	0.9	N	N	N	0	1	R	0	N	B	1	F	35	1	5.3
53	82	5.1	0.9	N	N	N	0	1	R	0	N	A	0	M	36	1	6.9
54	73	4.1	1.1	N	N	N	0	2	R	0	N	B	1	F	32	1	5.2
55	80	4.4	0.9	N	N	N	0	1	R	0	N	A	1	F	36	1	5.6
56	82	5.8	1.1	N	N	N	0	1	R	0	N	B	0	F	35	1	5.5
57	70	2.9	0.8	N	N	N	0	1	R	0	N	B	0	F	35	0	4.8
58	69	3.2	1.0	N	N	N	0	1	R	0	N	B	1	U	34	1	5.6
59	74	4.1	1.0	N	N	N	0	1	R	0	N	B	1	M	34	1	5.2
60	76	4.1	0.9	N	N	N	0	0	R	0	N	B	1	F	35	1	4.7

Appendix H.

SUMMARY OF FISH AUTOPSY

LOCATION: Lyons Ferry QUAL. CONTROL INSPECT. NO.: 730

Species: Chinook
Strain: Falls
Mark/Lot: See Remarks
Unit: NA
Fish Source: Lyons
Egg Source: Lyons
Hatching Date: NA

Autopsy Date: 05/24/88
Age: BY 87
Water Temp.: 53 F
Water Hardness: NA ppm
Investigator: PM/JC
Reason for Autopsy: Pre-lib Exam

Sample Size: 60
Tissue Collection No.: 730
Disease Survey No.: 730
Case History No.: 730
Custody No.: 730

Remarks: Normal release zeros

	MEAN	STANDARD DEVIATION	COEFFICIENT OF VARIATION
Length	92.570 mm	9.39 mm	10%
Weight	7.180 gr	2.2 gr	31%
Ktl*	0.910	0.04	4%
Ctl**	3.288		
Hematocrit	37.470	4.09	11%
Leucocrit	0.600	0.49	82%
Serum Protein	4.120	1.1	27%

*Expressed as Ktl times 10 to the fifth power
**Converted from Ktl; expressed as Ctl times 10 to the fourth power

VALUES AS PERCENT OF TOTAL SAMPLE

EYES	GILLS	PSEUDO-BRANCHS	THYMUS	MESEN. FAT	SPLEEN	HIND GUT	KIDNEY	LIVER	BILE
N 100%	N 100%	N 97%	0 100%	7%	B 5%	0 100%	N 100%	A 33%	0 43%
B1 0%	F 0%	S 3%	1 0%	0 45%	R 95%	1 0%	S 0%	B 65%	1 52%
B2 0%	C 0%	L 0%	2 0%	2 48%	G 0%	2 0%	M 0%	C 2%	2 5%
E1 0%	M 0%	S&L 0%	x 0.0	3 0%	NO 0%	x 0.0	G 0%	D 0%	3 0%
E2 0%	P 0%	I 0%		4 0%	E 0%		U 0%	E 0%	x 0.6
H1 0%	OT 0%	OT 0%		x 1.4	OT 0%		OT 0%	F 0%	
H2 0%								OT 0%	
M1 0%									
M2 0%									
OT 0%									

Summary of Normals

100%	100%	97%	100%	100%	100%	100%	98%	

Summary of Means

			0.0	1.4		0.0		0.6

SEX: M: 55% F: 42% U: 3%

GENERAL REMARKS

FINS Frayed caudal, #11

SKIN NA

GONADS NA

OTHER Barge, 63 52/11,13 R6--Station, 63 52/14,16 R6

Appendix H.

Qual.Qual. Control N730 86-8A

N	LGH	WGT	Ktl	EYE	GILL	PSBR	THY	FAT,	SPL	GUT	KID	LIV	BILE	SEX	HEM	LEU	SPR
1	98	8.7	0.9	N	N	N	0	1	R	0	N	B	1	F	40	0.0	4.4
2	94	7.7	0.9	N	N	N	0	1	R	0	N	B	1	M	35	0.0	3.8
3	97	7.8	0.9	N	N	N	0	2	R	0	N	B	1	F	40	1.0	5.2
4	102	8.9	0.8	N	N	N	0	2	R	0	N	B	0	M	38	0.0	4.3
5	105	10.6	0.9	N	N	N	0	2	B	0	N	B	1	M	43	0.0	4.4
6	83	5.1	0.9	N	N	N	0	2	R	0	N	A	0	U	45	0.0	3.6
7	99	8.4	0.9	N	N	N	0	2	B	0	N	B	1	F	39	0.0	4.1
8	85	5.1	0.8	N	N	N	0	1	B	0	N	B	1	M			3.4
9	80	4.6	0.9	N	N	N	0	2	R	0	N	B	1	F	34	1.0	
0	93	6.9	0.9	N	N	N	0	2	R	0	N	B	1	M	44	1.0	4.7
1	88	6.1	0.9	N	N	N	0	1	R	0	N	B	0	M	37	0.0	4.0
2	102	9.4	0.9	N	N	N	0	2	R	0	N	B	1	M	37	0.0	4.0
3	92	6.8	0.9	N	N	N	0	2	R	0	N	B	2	F	30	1.0	4.0
4	106	10.2	0.9	N	N	N	0	2	R	0	N	B	1	M	35	1.0	4.3
5	98	8.3	0.9	N	N	N	0	1	R	0	N	B	1	F	37	1.0	4.4
6	92	6.6	0.8	N	N	N	0	2	R	0	N	C	0	M	39	0.0	4.5
7	103	9.3	0.9	N	N	S	0	2	R	0	N	B	1	M	33	0.0	3.2
8	101	8.7	0.8	N	N	N	0	2	R	0	N	B	0	M	30	1.0	3.9
9	88	6	0.9	N	N	N	0	1	R	0	N	A	0	M	39	1.0	4.6
20	82	4.9	0.9	N	N	S	0	1	R	0	N	A	1	U	37	1.0	4.4
21	87	5.9	0.9	N	N	N	0	1	R	0	N	B	1	F	23	1.0	
22	100	8.8	0.9	N	N	N	0	2	R	0	N	A	0	M			4.6
23	107	11.4	0.9	N	N	N	0	2	R	0	N	B	0	M	38	1.0	4.3
24	97	8	0.9	N	N	N	0	2	R	0	N	B	1	F	39	1.0	5.0
25	103	9.9	0.9	N	N	N	0	1	R	0	N	A	2	M	36	0.0	3.7
26	76	3.9	0.9	N	N	N	0	1	R	0	N	B	0	F	37	0.0	3.9
27	84	5.5	0.9	N	N	N	0	1	R	0	N	B	1	M	43	0.0	6.0
28	88	5.7	0.8	N	N	N	0	1	R	0	N	B	0	F	40	0.0	4.2
29	89	6	0.9	N	N	N	0	1	R	0	N	B	0	F	36	1.0	4.1
30	86	5.7	0.9	N	N	N	0	2	R	0	N	B	1	M	43	1.0	5.3
31	104	10	0.9	N	N	N	0	2	R	0	N	A	1	M	38	0.0	4.8
32	108	11.5	0.9	N	N	N	0	2	R	0	N	B	1	F	38	0.0	5.1
33	98	8	0.8	N	N	N	0	2	R	0	N	B	1	F	39	1.0	4.0
34	77	3.8	0.8	N	N	N	0	1	R	0	N	A	0	M	33	1.0	3.8
35	96	7.8	0.9	N	N	N	0	1	R	0	N	A	1	F	36	0.0	4.5
36	91	6.9	0.9	N	N	N	0	1	R	0	N	B	1	M	35	1.0	4.9
37	96	8	0.9	N	N	N	0	1	R	0	N	A	0	M	35	1.0	4.8
38	113	12.4	0.9	N	N	N	0	2	R	0	N	A	1	M	38	1.0	4.5
39	97	8	0.9	N	N	N	0	1	R	0	N	A		F	35	1.0	4.7
40	94	7.7	0.9	N	N	N	0	2	R	0	N	B	8	M	40	1.0	4.7
41	103	9.5	0.9	N	N	N	0	1	R	0	N	A		F	43	1.0	5.0
42	86	5.7	0.9	N	N	N	0	2	R	0	N	B		F	38	1.0	4.5
43	85	5	0.8	N	N	N	0	1	R	0	N	B	I	F	38	1.0	4.8
44	103	10.7	1.0	N	N	N	0	0	R	0	N	B	1	F	32	1.0	3.9
45	88	5.5	0.8	N	N	N	0	0	R	0	N	B	0	F	36	1.0	4.3
46	87	5.4	0.8	N	N	N	0	0	R	0	N	B	1	M	33	1.0	4.0
47	101	8.8	0.9	N	N	N	0	1	R	0	N	A	1	M	38	0.0	3.7
48	72	3.4	0.9	N	N	N	0	0	R	0	N	A	1	F			
49	92	6.6	0.8	N	N	N	0	2	R	0	N	B	0	F	38	1.0	4.9
50	100	8.9	0.9	N	N	N	0	2	R	0	N	A	1	F	33	1.0	4.0
51	101	9.5	0.9	N	N	N	0	2	R	0	N	B		M	39	0	3.7
52	81	4.7	0.9	N	N	N	0	1	R	0	N	B	8	M	35	1	4.1
53	97	8.4	0.9	N	N	N	0	1	R	0	N	B	2	M	32	1	4.8
54	93	6.6	0.8	N	N	N	0	1	R	0	N	A	0	M	46	1	3.0
55	76	3.9	0.9	N	N	N	0	2	R	0	N	A	1	M	41	1	5.1
56	86	5	0.8	N	N	N	0	1	R	0	N	A	0	F			
57	83	5	0.9	N	N	N	0	2	R	0	N	B	0	M	44	0	5.0
58	76	3.9	0.9	N	N	N	0	2	R	0	N	B	0	M	40	1	3.5
59	79	4.1	0.8	N	N	N	0	1	R	0	N	A	1	M	35	0	4.0
60	86	5.4	0.8	N	N	N	0	1	R	0	N	A	1	F	43	0	3.8

Appendix H.

SUMMARY OF FISH AUTOPSY

LOCATION: Cowlitz QUAL. CONTROL INSPECT. NO.: 733

Species: Chinook
Strain: Fall
Mark/Lot: NA
Unit: NA
Fish Source: Cowlitz
Egg Source: Cowlitz
Hatching Date: NA
Remarks: Delayed release zeros

Autopsy Date: 09/22/88
Age: BY 87
Water Temp.: 51 F
Water Hardness: NA ppm
Investigator: BR/PM/CK
Reason for Autopsy: Pre-lib Exam

Sample Size: 6(
Tissue Collection No.: 733
Disease Survey No.: 733
Case History No.: 733
Custody No.: 733

	MEAN	STANDARD DEVIATION	COEFFICIENT OF VARIATION
Length	144.700 mm	13.74 mm	9%
Weight	30.230 gr	8.43 gr	28%
Ktl*	1.000	0.05	5%
Ctl**	3.613		
Hematocrit	34.480	3.58	10%
Leucocrit	0.680	0.53	78%
Serum Protein	4: 960	1.45	29%

*Expressed as Ktl times 10 to the fifth power
**Converted from Ktl; expressed as Ctl times 10 to the fourth power

VALUES AS PERCENT OF TOTAL SAMPLE

EYES	GILLS	PSEUDO-BRANCHS	THYMUS	MESEN. FAT	SPLEEN	HIND GUT	KIDNEY	LIVER	BILE
N 100%	N 95%	N 100%	0 67%	0%	B 0%	0 100%	N 100%	A 13%	0 28%
B1 0%	F 0%	S 0%	1 30%	0 43%	R 93%	1 0%	S 0%	B 85%	1 62%
B2 0%	C 0%	L 0%	2 3%	2 55%	G 2%	2 0%	M 0%	C 2%	2 10%
E1 0%	M 0%	S&L 0%	x 0.4	2%	NO 0%	x 0.0	G 0%	D 0%	3 0%
E2 0%	P 5%	I 0%		2 0%	E 5%		U 0%	E 0%	x 0.8
H1 0%	OT 0%	OT 0%		x 1.6	OT 0%		OT 0%	F 0%	
H2 0%								OT 0%	
M1 0%									
M2 0%									
OT 0%									
Summary of Normals									
100%	95%	100%	67%		95%	100%	100%	98%	
Summary of Means									
			0.4	1.6		0.0			0.8

SEX: M: 60% F: 40% u: 0%

GENERAL REMARKS

FINS NA

SKIN NA

GONADS NA

OTHER Fish smolted. #24-liver pustules. #27,41-necrotic lame1 .ae.

Appendix H.

Qual.Qual. **Control N733 86**

SN	LGH	WGT	Ktl	EYE	GILL	PSBR	THY	FAT	SPL	GUT	KID	LIV	BILE	SEX	HEM	LEU	SPR
1	146	31.9	1.0	N	N	N	0	2	R	O	N	B	1	M	**37**	**1.0**	**5.8**
2	152	33.6	1.0	N	N	N	1	2	R	O	N	B	1	M	**37**	**0.0**	**5.4**
3	157	36.4	0.9	N	N	N	0	2	E	O	N	B	1	M	31	0.0	4.7
4	102	10.3	1.0	N	P	N	0	1	R	O	N	B		F	26	0.0	5.1
5	110	12.4	0.9	N	N	N	0	2	R	O	N	B	8	M	32	0.0	5.8
6	157	38.8	1.0	N	N	N	0	2	R	O	N	B	1	F	40	1.0	5.5
7	135	22.2	0.9	N	P	N	0	1	E	O	N	B	1	F	39	0.0	4.9
8	164	47.8	1.1	N	N	N	1	2	R	O	N	B		F	38	1.0	6.5
9	125	18.3	0.9	N	N	N	0	1	R	O	N	B	8	M	35	0.0	5.5
10	150	33.1	1.0	N	N	N	1	1	R	O	N	B	0	F	35	1.0	5.3
11	155	36.2	1.0	N	N	N	1	2	R	O	N	B	2	M	30	1.0	4.9
12	136	23	0.9	N	N	N	0	1	R	O	N	B	1	M	32	1.0	4.5
13	157	37.8	1.0	N	N	N	0	2	R	O	N	B	1	M	31	1.0	5.2
14	159	36.9	0.9	N	N	N	0	1	R	O	N	B	0	F	38	1.0	5.6
15	152	36.2	1.0	N	N	N	0	2	R	O	N	B	1	M	38	2.0	5.6
16	157	37.9	1.0	N	N	N	1	2	R	O	N	B	1	F	37	1.0	5.8
17	152	33.7	1.0	N	N	N	0	2	R	O	N	B	1	M	35	1.0	5.0
18	152	34.8	1.0	N	N	N	0	1	R	O	N	B	1	M	33	0.0	5.7
19	146	27.7	0.9	N	N	N	2	1	R	O	N	B	1	F	35	1.0	4.6
20	150	32.3	1.0	N	N	N	0	2	R	O	N	B	0	M	29	1.0	5.3
21	143	28.6	1.0	N	N	N	0	2	R	O	N	B	1	M	32	1.0	5.9
22	166	48.8	1.1	N	N	N	1	3	R	O	N	B	0	F	37	1.0	5.8
23	153	32.8	0.9	N	N	N	0	2	R	O	N	B	2	M	**43**	**1.0**	**6.1**
24	117	15.8	1.0	N	N	N	0	1	R	O	N	C	0	F	**27**	**0.0**	**3.0**
25	135	23.8	1.0	N	N	N	1	2	R	O	N	B	1	M	38	1.0	5.4
26	158	39.9	1.0	N	N	N	1	2	G	O	N	A	1	F	38	1.0	5.8
27	127	21.4	1.0	N	P	N	0	1	R	O	N	B	1	M	28	0.0	5.8
28	158	40.4	1.0	N	N	N	0		R	O	N	B	1	F	33	1.0	5.6
29	146	29.4	0.9	N	N	N	0		R	O	N	B	2	F	31	2.0	5.0
30	143	27.1	0.9	N	N	N	0	2	R	O	N	B	1	F	35	1.0	5.0
31	158	37.2	0.9	N	N	N	1	1	R	O	N	B	2	F	33	1.0	5.2
32	145	27.3	0.9	N	N	N	0	1	R	O	N	B	2	F	34	0.0	5.5
33	157	37.9	1.0	N	N	N	0	1	R	O	N	A	1	M	35	1.0	4.5
34	136	24.1	1.0	N	N	N	0	1	E	O	N	B	1	M	29	0.0	4.5
35	163	43.6	1.0	N	N	N	0	2	R	O	N	B	0	M	36	1.0	5.8
36	158	42	1.1	N	N	N	0	2	R	O	N	B	1	M	34	1.0	5.1
37	144	29.4	1.0	N	N	N	0	1	R	O	N	A	0	M	**31**	0.0	4.6
38	138	23.9	0.9	N	N	N	0	1	R	O	N	B	1	M	32	1.0	5.5
39	123	18.3	1.0	N	N	N	0	2	R	O	N	B	1	M	37	0.0	5.2
40	146	27.3	0.9	N	N	N	0	1	R	O	N	B	2	M	**38**	1.0	5.1
41	161	42.8	1.0	N	N	N	1	2	R	O	N	B	1	M	**36**	**1.0**	**5.8**
42	135	23.4	1.0	N	N	N	1	2	R	O	N	B	1	F	**36**	**1.0**	**4.5**
43	148	27.4	0.8	N	N	N	0	1	R	O	N	B	1	F	**41**	**1.0**	**5.2**
44	149	30.1	0.9	N	N	N	0	1	R	O	N	A	1	M	41	1.0	7.0
45	142	27.7	1.0	N	N	N	1	1	R	O	N	A		F	35	0.0	6.2
46	136	24.2	1.0	N	N	N	1	1	R	O	N	B	8	M	33	1.0	5.0
47	137	25.6	1.0	N	N	N	0	2	R	O	N	B	1	M	34	0.0	5.5
48	139	25.7	1.0	N	N	N	1	2	R	O	N	B	1	M	29	1.0	4.4
49	136	25.8	1.0	N	N	N	0	1	R	O	N	B	0	F	**34**	**0.0**	**5.3**
50	122	17	0.9	N	N	N	0	2	R	O	N	B	1	M	**32**	**1.0**	**5.2**
51	131	21.5	1.0	N	N	N	1	1	R	O	N	B	0	M	**31**	**1.0**	**5.0**
52	151	36.4	1.1	N	N	N	1	1	R	O	N	B	1	F	34	1.0	5.8
53	149	31.5	1.0	N	N	N	0	1	R	O	N	B	1	M	35	1.0	5.0
54	155	35.3	0.9	N	N	N	0	2	R	O	N	A	1	M	**39**	**1:0**	4.6
55	142	26.5	0.9	N	N	N	2	2	R	O	N	A	0	M	36	0.0	5.4
56	156	40.1	1.1	N	N	N	1	2	R	O	N	A	1	F	32	0.0	5.3
57	114	14.7	1.0	N	N	N	0	2	R	O	N	B	0	M	**36**	**1:0**	5.3
58	148	29.9	0.9	N	N	N	1	2	R	O	N	B	1	F	38	0.0	5.8
59	152	35.1	1.0	N	N	N	0	2	R	O	N	B	1	F			
60	151	32.8	1.0	N	N	N	0	1	R	O	N	B	1	M	37	0.0	6.0
															31	0.0	5.0