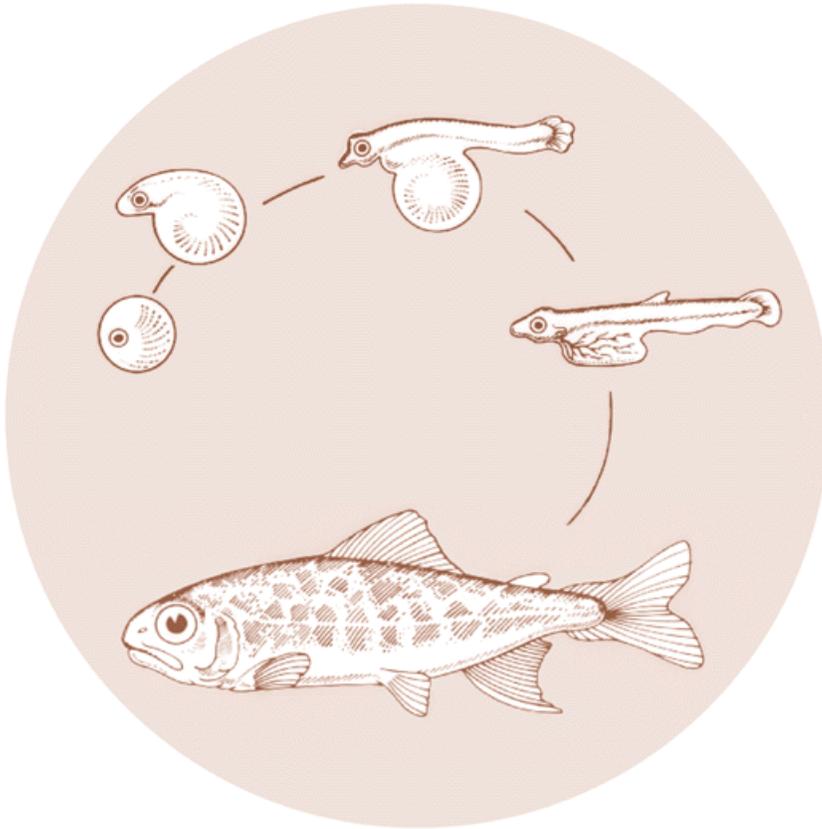


August 1993

MINTHORN SPRINGS CREEK SUMMER JUVENILE RELEASE & ADULT COLLECTION FACILITY

Annual Report 1992



DOE/BP-17622-7



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:

Rowan, Gerald D., Confederated Tribes of the Umatilla Indian Reservation, Minthorn Springs Creek Summer Juvenile Release & Adult Collection Facility, Annual Report 1992 to Bonneville Power Administration, Portland, OR, Contract 84-BI-17622, Project 83-435, 120 electronic pages (BPA Report DOE/BP-17622-7)

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**MINTHORN SPRINGS CREEK SUMMER JUVENILE RELEASE &
ADULT COLLECTION FACILITY**

ANNUAL REPORT 1992

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Department of Natural Resources
Fisheries Program**

Prepared for:

**U.S. Department of Energy
Bonneville Power Administration
Division of Fish and Wildlife
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**Project Number 83-435
Contract Number DE-BI79-84BP 17622**

AUGUST 1993

ABSTRACT

The Confederated Tribes of the Umatilla Indian Reservation (CTUIR) and Oregon Department of Fish and Wildlife (ODFW) are cooperating in a joint effort to supplement steelhead and re-establish salmon runs in the Umatilla River Basin. As an integral part of this program, Bonifer and Minthorn Acclimation Facilities are operated for holding and spawning adult steelhead and fall chinook salmon and acclimation and release of juvenile salmon and steelhead.

Acclimation of 109,101 spring chinook salmon and 19,977 summer steelhead was completed at Bonifer in the spring of 1992. At Minthorn, 47,458 summer steelhead were acclimated and released. Control groups of spring chinook salmon were released instream concurrent with the acclimated releases to evaluate the effects of acclimation on adult returns to the Umatilla River. Acclimation studies with summer steelhead were not conducted in 1992.

A total of 237 unmarked adult steelhead were collected for broodstock at Three Mile Dam from October 18, 1991 through April 24, 1992 and held at Minthorn. Utilizing a 3 x 3 spawning matrix, a total of 476,871 green eggs were taken from 86 females. The eggs were transferred to Umatilla Hatchery for incubation, rearing, and later release into the Umatilla River.

A total of 211 fall chinook salmon were also collected for broodstock at Three Mile Dam and held at Minthorn. Using a 1:1 spawning ratio, a total of 195,637 green eggs were taken from 58 females. They were also transferred to Umatilla Hatchery for incubation, rearing, and later release into the Umatilla River.

Personnel from the ODFW Eastern Oregon Fish Pathology Laboratory in La Grande took samples of tissues and reproductive fluids from Umatilla River summer steelhead and fall chinook salmon broodstock for monitoring and evaluation purposes. Cell culture assays for replicating agents, including IHNV virus, on all spawned fish were negative. One of 60 summer steelhead tested positive for EIBS virus, while all fall chinook tested were negative for inclusions. One of 73 summer steelhead sampled for BKD had a high level of antigen, while all others had very low or negative antigen levels. All fall chinook tested had low or negative antigen levels.

Regularly-scheduled maintenance of pumps, equipment and facilities was performed in 1992.

The progress of outmigration for juvenile releases was monitored at the Westland Canal fish trapping facility by CTUIR and ODFW personnel. Coho and spring chinook yearlings were released in mid-March at Umatilla rivermile (RM) 56 and 60. The peak outmigration period past Westland (RM 27) was mid-April to early May, approximately four to seven weeks after release. Groups of summer steelhead were released from Minthorn

(RM 63) and Bonifer (RM 81) in late March and into Meacham Creek near Bonifer in late April. The peak outmigration period past Westland for all groups appeared to be the first two to three weeks in May. Spring chinook yearlings released in mid-April from Bonifer and at Umatilla RM 89, migrated rapidly downriver and the peak outmigration period past Westland appeared to be within a week or two after release. Fall and spring chinook subyearlings released in mid-May at RM 42 and 60, respectively, also migrated rapidly downriver and the peak outmigration period was within days after release.

Coded-wire tag recovery information was accessed to determine the contribution of Umatilla River releases to the ocean, Columbia River and Umatilla River fisheries. Total estimated summer steelhead survivals have ranged from 0.03 to 0.61% for releases in which recovery information is complete. Coho survival rates have ranged from 0.15 to 4.14%, and spring chinook yearling survival rates from spring releases have ranged from 0.72 to 0.74%. Survival rates of fall chinook yearlings have ranged from 0.08 to 3.01%, while fall chinook subyearling survival rates have ranged from 0.25 to 0.87% for spring released groups.

ACKNOWLEDGEMENTS

This study was funded by Bonneville Power Administration (BPA). The Confederated Tribes of the Umatilla Indian Reservation (CTUIR) thanks Jerry Bauer, Jay Marcotte and other BPA personnel for their assistance. Thanks are extended to Jack Hurst, Randy Winters, Warren Groberg, Sam Onjukka and other Oregon Department of Fish and Wildlife (ODFW) personnel for providing assistance in the spawning of summer steelhead and fall chinook salmon and for monitoring the fish for the presence of fish pathogens. Bill Duke and other ODFW staff assisted in the collection of data at Three Mile Dam and Westland Canal. Dennis Issac and Bill Murray (ODFW) retrieved and decoded coded-wire tags from adult fish snouts and Bob Becker (ODFW) supervised and coordinated fish transfers to the acclimation facilities. Thanks are extended to Dan Barrett, Ray Hill and Jack Hurst (ODFW hatchery managers) and their staff for rearing the fish used in the acclimation experiments. We thank the landowners, Rosemary and Wes Gladow, and Richard Kaye for their cooperation and the Union Pacific Railroad for providing access to the acclimation facilities.

Thanks go to the CTUIR staff for their cooperation and contributions to this report. Brian Zimmerman, Clif Picard, Gene Shippentower, Larry Cowapoo, Vern Spencer and Malissa Minthorn collected much of the data from adults returning to Three Mile Dam and migration data for juvenile salmonids captured at the Westland Canal fish trapping facility. Other biologists and technicians assisted in field sampling. Joe Richards provided the administration of the agreement and Julie Burke and Celeste Reves provided secretarial services. Gary James provided technical oversight and critical review of this report and Paul Kissner also provided critical review.

Thanks go to Mike McCloud and Dave McKay for the long hours and weekends spent running the acclimation facilities and for collecting much of the data.

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INTRODUCTION

Background

The Umatilla River Basin historically supported large runs of anadromous salmonids, including summer steelhead (*Oncorhynchus mykiss*), fall and spring chinook salmon (*O. tshawytscha*) and coho salmon (*O. kisutch*). The runs of chinook and coho salmon were essentially eliminated in the early 1900's. The losses have generally been attributed to the development of hydroelectric dams and to forestry, agriculture and irrigation practices. The single indigenous naturally spawning anadromous stock left in the Umatilla River Basin is a run of approximately 1,000 to 3,000 summer steelhead (Figure 1). This steelhead run has been supplemented with fish from Washington (Skamania) and Idaho (Oxbow) stocks from 1967 through 1970 (Table 1). Fish of Umatilla River origin were used in 1975 and from 1981 to the present. The run has varied from 6.7% hatchery fish in 1987-88 (the first season that fin-clipped fish were differentiated), to 34.8% in the 1990-91 season (Figure 1). The natural run in 1990-91 however, was one of the lowest on record. Returns of hatchery steelhead have ranged from 166 adults in 1987-88 to 523 adults in 1991-92. Runs of coho and chinook salmon have been rebuilt from various stocks (Tables 2, 3 and 4).

A comprehensive plan developed by the Confederated Tribes of the Umatilla Indian Reservation (CTUIR) and Oregon Department of Fish and Wildlife (ODFW) was implemented to supplement steelhead and re-establish salmon runs in the Umatilla River Basin. Among the initial steps in the plan was construction of two acclimation facilities completed on the Umatilla Indian Reservation. Both facilities were constructed and are operated under the Fish and Wildlife Program of the Northwest Power Planning Council, and are funded by Bonneville Power Administration (BPA).

Facility Descriptions and Operations

The Bonifer Pond Facility (Bonifer) is located adjacent to Meacham Creek at rivermile (RM) 2 (Figure 2). The pond spills into Boston Canyon Creek which flows about 20 yards before entering Meacham Creek. Meacham Creek flows into the Umatilla River at RM 79. A water control structure was completed at the outlet of an existing pond and operations began in 1984. The 1.75-acre pond has 4.5 acre-feet of water. It is fed by three springs that originate from 1/8 to 1/2 mile away. A concrete fishway which can be used as an adult trap, and a parallel underground culvert which was added later, are the two release structures that drain the pond.

The Minthorn Springs Facility (Minthorn) is located about four miles east of Mission, Oregon (Figure 2). Minthorn Springs Creek is formed from the inflow of several springheads located immediately south of the Umatilla River and east of the facility. The creek is about one mile long, with the facility located near the mouth at Umatilla RM 63. Minthorn was completed in 1985 and first operated in 1986. Two concrete raceways (120 x 12 feet) were constructed for acclimation of juvenile salmonids. Water is pumped about

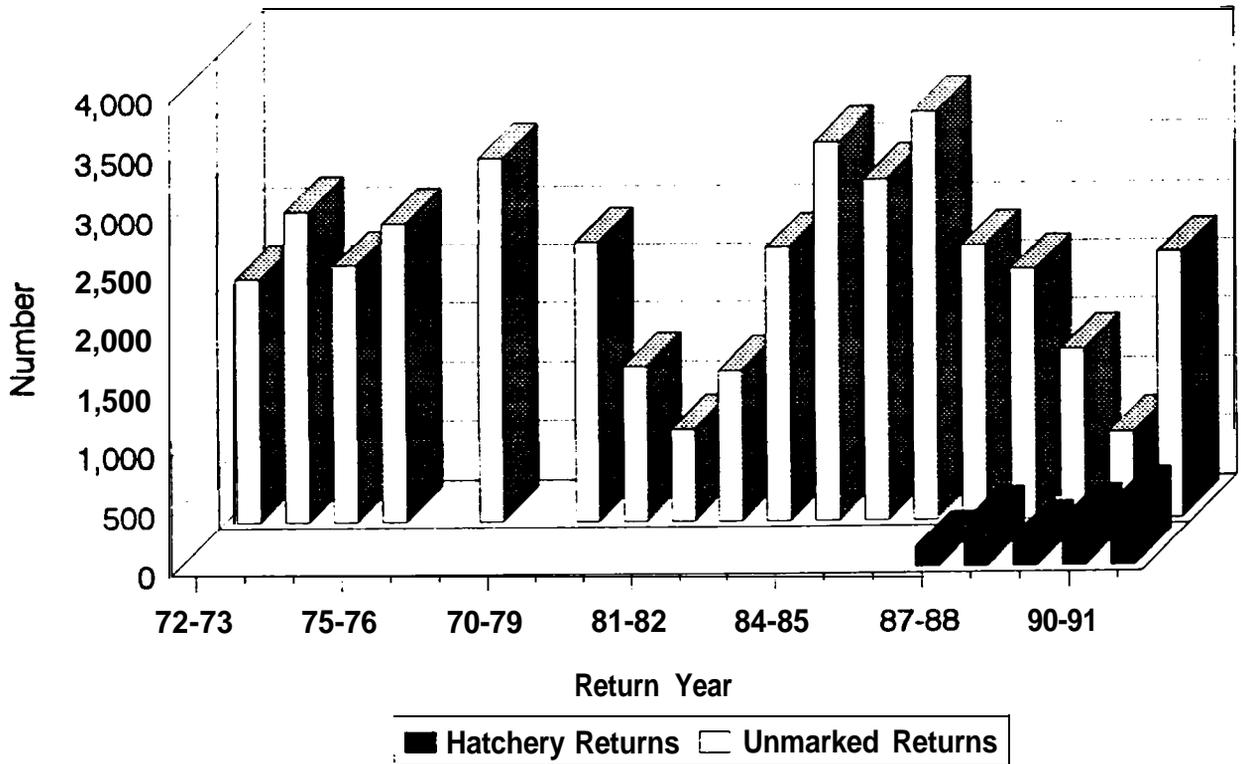


Figure 1. Returns of wild and hatchery adult steelhead to Threemile Dam on the Umatilla River, 1972-92 (Returns numbers from the fall of 1972 to the spring of 1987 are estimates, while return numbers beginning in the fall of 1987 are from actual counts).

Table 1. Hatchery releases of summer steelhead in the Umatilla River.

Year of Release	Hatchery	No. Released	No./lb.	Stock
1967	Gnat Creek	109,805	75.0	Skamania
1967	Oak Springs	238,020	117.0	Idaho (Oxbow)
1967	Wallowa	142,240	240.0	Idaho (Oxbow)
1968	Gnat Creek	23,100	66.0	Skamania
1968	Gnat Creek	150,000	Eggs	Skamania
1969	Oak Springs	174,341	145.0	Skamania
1970	Carson	23,400	9.0	Skamania
1970	Carson	16,089	8.0	Skamania
1975	Wizard Falls	11,094	9.0	Umatilla River
1981	Oak Springs	17,558	6.0–9.0	Umatilla River
1981	Oak Springs	9,400	145.0	Umatilla River
1982	Oak Springs	59,494	7.0–8.0	Umatilla River
1982	Oak Springs	67,940	124.0	Umatilla River
1983	Oak Springs	60,500	11.0	Umatilla River
1983	Oak Springs	52,700	62.0	Umatilla River
1984	Oak Springs	57,939	6.5	Umatilla River
1984	Oak Springs	22,000	135.0	Umatilla River
1985	Oak Springs	53,850	7.0	Umatilla River
1985	Oak Springs	39,134	150.0	Umatilla River
1986	Oak Springs	54,137	8.4	Umatilla River
1987	Oak Springs	1,485	5.5	Umatilla River
1988	Oak Springs	95,290	6.5–10.3	Umatilla River
1988	Oak Springs	10,033	57.5	Umatilla River
1988	Irrigon	24,618	3200.0	Umatilla River
1989	Oak Springs	29,852	6.6	Umatilla River
1989	Oak Springs	29,586	5.6	Umatilla River
1989	Oak Springs	22,274	5.5	Umatilla River
1990	Oak Springs	29,522	7.7	Umatilla River
1990	Oak Springs	30,225	5.9	Umatilla River
1990	Oak Springs	29,446	5.5	Umatilla River
1991	Oak Springs	30,221	6.2	Umatilla River
1991	Oak Springs	29,325	8.7	Umatilla River
1991	Oak Springs	12,389	7.5	Umatilla River
1991	Oak Springs	3,998	12.5	Umatilla River
1992	Umatilla	19,977	5.8	Umatilla River
1992	Umatilla	47,458	5.8	Umatilla River
1992	Umatilla	64,550	5.0	Umatilla River
1992	Umatilla	67,419	5.5	Umatilla River
1992	Umatilla	5,443	5.8	Umatilla River

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Table 2. Hatchery releases of fall chinook salmon in the Umatilla River.

Year of Release	Hatchery	No. Released	No./lb.	Stock
1982	Bonneville	978,336	79.0	Tule
1982	Bonneville	2,828,835	92.0	Tule
1982	Bonneville	290,680	130.0	Tule
1983	Bonneville	100,564	5.9	Bonneville URB
1964	Bonneville	228,412	8.6	Bonneville URB
1984	Bonneville	996,250	85.1	Bonneville URB
1985	Bonneville	3,223,172	92.3	Bonneville URB
1985	Bonneville	198,162	7.8	Bonneville URB
1985	Bonneville	5,100	16.2	Bonneville URB
1986	Irrigon	91,036	5.0	Bonneville URB
1986	Irrigon	115,779	4.7	Bonneville URB
1986	Irrigon	2,029,602	86.0	Bonneville URB
1986	Irrigon	35,574	11.6	Bonneville URB
1987	Irrigon	1,476,830	60.4	Priest Rapids URB
1987	Bonneville	109,143	8.1	Bonneville URB
1987	Bonneville	102,363	8.6	Bonneville URB
1987	Irrigon	2,000	20.0	Priest Rapids URB
1988	Irrigon	1,886,757	68.3	Priest Rapids URB
1988	Irrigon	1,429,250	93.1	Bonneville URB
1988	Irrigon	14,408	9.8	Priest Rapids URB
1988	Irrigon	79,681	8.6	Priest Rapids URB
1988	Bonneville	99,550	10.2	Bonneville URB
1988	Bonneville	100,791	8.8	Bonneville URB
1989	Bonneville	217,443	8.6	Bonneville URB
1989	Irrigon	2,393,710	66.6	Priest Rapids URB
1989	Irrigon	156,957	10.9-11.1	Priest Rapids URB
1989	Irrigon	658,305	76.2	Bonneville URB
1990	Bonneville	255,614	8.2	Bonneville URB
1990	Bonneville	2,425,681	87.5	Bonneville URB
1990	Irrigon	629,800	82.4	Priest Rapids URB
1990	Irrigon	71,864	9.2	Bonneville URB
1990	Irrigon	76,646	8.8	Bonneville URB
1991	Bonneville	194,847	7.8	Upriver Brights
1991	Irrigon	3,198,673	73.0-83.0	Upriver Brights
1991	Irrigon	2,774	194.0	Upriver Brights
1991	Irrigon	7,688	80.0	Upriver Brights
1991	Irrigon	79,672	80.5	Upriver Brights
1991	Irrigon	74,865	86.0	Upriver Brights
1992	Bonneville	122,639	7.7	Upriver Brights
1992	Bonneville	97,801	7.6	Upriver Brights
1992	Umatilla	304,968	61.7	Upriver Brights
1992	Umatilla	1,949,752	61.1	Upriver Brights
1992	Umatilla	140,149	67.7	Upriver Brights
1992	Umatilla	139,250	67.8	Upriver Brights
1992	Umatilla	144,224	67.7	Upriver Brights
1992	Umatilla	2,670	112.0	Upriver Brights
1992	Irrigon	504,369	53.4	Umatilla River
1992	Irrigon	5,167	62.8	Umatilla River

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Table 3. Hatchery releases of spring chinook salmon in the Umatilla River.

Year of Release	Hatchery	No. Released	No./lb.	Stock
1986	Carson	99,970	22.8	Carson
1986	Irrigon	300,438	87.0	Carson
1986	Irrigon	75,000	15.0	Carson
1987	Carson	99,897	10.4	Carson
1987	Oxbow	169,100	199.0	Carson
1988	Bonneville	1,196	21.4	Carson
1988	Carson	99,895	20.6	Carson
1988	Bonneville	297,377	8.3–10.3	Carson
1988	Bonneville	75,767	11.1	Carson
1989	Bonneville	160,917	10.6	Carson
1989	Bonneville	164,603	12.0	Carson
1990	Carson	99,775	18.6	Carson
1990	Bonneville	231,772	9.0-9.6	Carson
1990	Bonneville	80,438	11.5	Carson
1990	Bonneville	77,998	13.4	Carson
1991	Carson	90,796	20.6	Carson
1991	Carson	5,937	16.9	Carson
1991	Bonneville	100,505	10.1	Carson /1
1991	Bonneville	96,152	11.8	Carson /1
1991	Bonneville	81,144	16.5	Carson
1991	Bonneville	78,480	16.8	Carson
1992	Carson	90,982	18.7	Carson
1992	Carson	5,272	18.7	Carson
1992	Bonneville	109,101	9.2	Carson /1
1992	Bonneville	98,928	8.5	Carson /1
1992	Umatilla	506,535	35.0	Carson
1992	Umatilla	449,217	35.9	Carson
1992	Inigon	294,458	32.5	Carson
1992	Bonneville	132,929	11.5	Carson
1992	Umatilla	101,416	19.4	Carson

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/1 Carson via Lookingglass stock.

Table 4. Hatchery releases of coho salmon in the Umatilla River.

Year of Release	Hatchery	No. Released	No./lb.	stock
1966	Little White Salmon	500,000	1312.0	Little White Salmon
1967	Little White Salmon	200,000	1067.0	Little White Salmon
1967	Cascade	500,000	Eggs	Tanner Creek
1968	Little White Salmon	750,000	Eggs	Little White Salmon
1969	Carson	200,040	23.0	Little white Salmon
1967	Cascade	948,549	13.5-14.0	Tanner Creek
1968	Cascade	996,433	16.6	Tanner Creek
1969	Cascade	753,637	15.3-19.7	Tanner Creek
1969	Cascade	233,269	17.2-19.1	Tanner Creek
1990	Cascade	796,642	14.7	Tanner Creek
1990	Cascade	192,066	11.2-13.5	Tanner Creek
1991	Cascade	152,974	15.4	Tanner Creek
1991	Cascade	228,293	16.5	Tanner Creek
1991	Cascade	221,365	16.6	Tanner Creek
1991	Cascade	143,054	16.4	Tanner Creek
1991	Cascade	209,923	17.1	Tanner Creek
1992	Cascade	469,165	15.7	Tanner Creek
1992	Cascade	472,221	15.5	Tanner Creek

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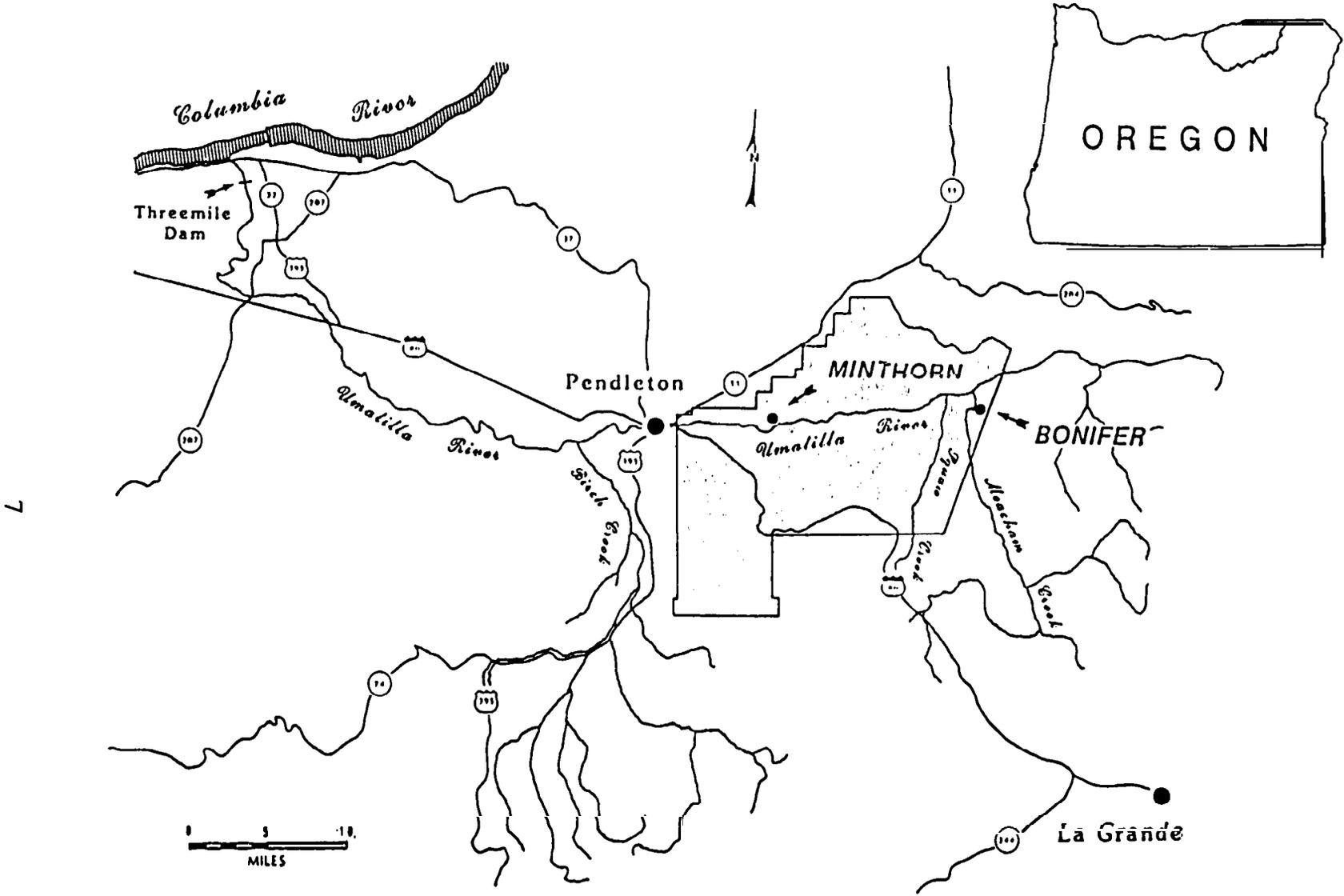


Figure 2. Confederated Tribes of the Umatilla Indian Reservation and Bonifer and Minthorn Acclimation Facilities.

40 feet from the creek to the raceways. Water depth is usually held at three feet with a single-pass water pumping rate of 800 gallons per minute through each raceway. Two valves control the effluent water to allow for either recycling of flows into the intake pond or discharge downstream of the intake and the adult holding area.

The Bonifer and Minthorn Acclimation Facilities are operated by CTUIR in cooperation with ODFW. The facilities are used for holding and spawning adult summer steelhead and fall chinook salmon and for acclimation and release of juvenile chinook and coho salmon and summer steelhead. The main goal of acclimation is to reduce stress from trucking prior to release and improve imprinting of juvenile salmonids in Umatilla River water sources in order to increase returns. Juveniles are transported to the acclimation facilities primarily from Umatilla and Bonneville Hatcheries. This report details activities associated with operation, maintenance and evaluation of the Bonifer and Minthorn Acclimation Facilities in 1992.

Project Objectives

The following specific project objectives for 1992 are part of overall objectives to operate, maintain and evaluate Bonifer and Minthorn Acclimation Facilities:

1. Acclimate and release groups of coded-wire tagged juvenile salmon and steelhead.
2. Monitor temperature, dissolved oxygen and flows daily during acclimation periods.
3. Monitor physical data and health of juveniles prior to release.
4. Operate, maintain and repair all equipment, buildings and grounds.
5. Monitor physical data of juveniles at downstream migrant traps and compare this data to data taken at release to give an indication of outmigration timing and size.
6. Collect a spectrum of the run of adult summer steelhead returning to the trap at Three Mile Dam and transport them to holding facilities.
7. Collect fall chinook salmon returning to the trap at Three Mile Dam and transport them to holding facilities.
8. Spawn adult summer steelhead and provide eggs to ODFW for rearing and later release in the Umatilla River.

9. Spawn fall chinook salmon and provide eggs to ODFW for rearing and later release in the Umatilla River.
10. Monitor adult mortality and fish spawned for physical data and disease analysis.
11. Collect data and snouts from coded-wire tagged fish and send the snouts to ODFW for tag retrieval and decoding.
12. Access coded-wire tag recovery information from the Pacific States Marine Fisheries Commission and other appropriate sources and determine the contribution of Umatilla River releases to the ocean, Columbia River and Umatilla River fisheries and survival to adulthood of all tagged groups of acclimated and control fish.

MATERIALS AND METHODS

Collection, Holding and Spawning of Summer Steelhead

Adult summer steelhead were collected for broodstock through the cooperative efforts of CTUIR, ODFW and Stanfield-Westland Irrigation District. Fish were collected from the trap at Three Mile Falls Dam, located three miles upstream from the mouth of the Umatilla River, during the period October 18, 1991 through April 24, 1992. The fish were transported to Minthorn using 370 or 3,000 gallon fish liberation units.

To help maintain the genetic integrity of the hatchery population, the first priority for broodstock was unmarked fish at a male to female ratio of 1:1. Coded-wire tagged hatchery fish were also collected initially however, to insure meeting the broodstock goal of 212 adults. The collection rate of unmarked adults in October and November was 15% of the unmarked run by month and one pair of hatchery fish was collected for every pair of unmarked fish. A strong showing of unmarked adults in late November and December allowed a reduction in the collection rates. From December through April, unmarked fish were collected at a rate of 10% of the unmarked run by month. In December, one pair of hatchery fish was collected for every two pair of unmarked fish, and due to a continued strong showing of unmarked adults, no hatchery fish were collected from January through April. These collection rates resulted in 95 hatchery and 237 unmarked broodstock being collected.

Adults were differentially marked during each month in which they were collected. A single hole paper punch was used to punch one, two or three holes in either the right or left opercle of the fish. Fish collected in April were not marked.

Beginning on February 13, 1992, the fish were treated twice per week with formalin (Paracide-F, Argent Chemical Laboratories) at 1:6,000 for one hour to help control fungus. After spawning began, treatments were increased to three times per week through the end of the spawning season.

Beginning on March 19, 1992, the fish were sorted weekly to determine maturation. The ripe fish were spawned by Umatilla Hatchery and CTUIR personnel using standard hatchery practices. A 3 x 3 spawning matrix was utilized whenever possible. The eggs from each family group were water hardened in iodophor at 75 ppm and transferred to Umatilla Hatchery for incubation, rearing and later release into the Umatilla River.

Fork and MEHP lengths were taken on all sacrificed fish and mortalities. MEHP length was defined as the distance from the middle of the eye to the base of an angle created by bending the tail 90 degrees to the angle of the body. Fin marks and opercle marks were recorded on all fish, and snouts and scales were collected from all hatchery fish. Scale samples were also taken from most unmarked broodstock.

Collection, Holding and Spawning of Fall Chinook Salmon

Fall chinook salmon were also collected at Three Mile Dam and transported to Minthorn for broodstock. Fish were collected from October 27 to November 17 and were transported in a 3,000 gallon, aerated tanker.

The fish were held in the lower raceway which was covered with nylon netting to prevent the fish from jumping out. They were treated three times per week with formalin at 1:6,000 for one hour.

From November 9 to November 24, the fish were sorted and spawned on five occasions by CTUIR and Umatilla Hatchery personnel. A spawning ratio of 1:1 was utilized, but after fertilization, the eggs from four females were pooled to form one family group. The eggs were water hardened in iodophor at 75 ppm and transferred to Umatilla Hatchery for incubation, rearing and later release into the Umatilla River.

After spawning was completed, all remaining fish were sacrificed. Lengths, weights and fin marks were recorded on all spawned fish, mortalities and sacrificed fish. Snouts and scale samples were taken from all coded-wire tagged fish and scale samples were also taken from most of the remaining broodstock.

Disease Sampling of Summer Steelhead Broodstock

All spawned adult steelhead were sampled for the presence of selected pathogens by ODFW Northeast Oregon Fish Pathology Laboratory (NOFPL) in La Grande for monitoring and evaluation purposes as part of the Fish Health Monitoring Program for BPA. All 172 spawned fish were sampled for replicating viral agents. The reproductive fluid (ovarian fluid from females or milt from males), pyloric caeca, kidney and spleen were sampled for infectious hematopoietic necrosis virus (IHNV) and infectious pancreatic necrosis virus (IPNV). Kidney smears from 73 spawned fish were sampled for bacterial kidney disease (BKD) and 60 blood samples were taken to examine for erythrocytic inclusion body syndrome (EIBS).

Eighteen steelhead that died during holding were frozen and subsequently sampled. Kidney smears were taken to test for BKD and samples of the lower intestine were examined for Ceratomyxa shasta. Cultures from the kidney were also taken to test for typical bacterial pathogens.

Disease Sampling of Fall Chinook Salmon Broodstock

All spawned fall chinook salmon were sampled for IHNV and IPNV. Kidney smears from 115 spawned fish were sampled for BKD and 112 blood samples were taken to examine for EIBS.

Adult Returns to Minthorn

The Minthorn adult V-trap was in operation from October 14 to November 27, 1991, and from February 19 through December, 1992. The trap was not in operation from November 28, 1991 to February 18, 1992, due to repairs necessitated because of flood water damage.

Adult Returns to Bonifer

The Bonifer adult V-trap was in operation from February 28 through September, 1992.

Acclimation and Release of Juvenile Salmonids

Juvenile salmonids were transported by ODFW from hatcheries to the acclimation facilities using 3,000 and 5,000 gallon fish liberation trucks and transfers were completed in one to two days. Juveniles were fed 3.0 mm Biomoist Feed (Bioproducts Inc., Warrenton, Oregon) twice each day. Mortalities were removed daily at both facilities. Transfer mortality (immediate and delayed mortality) was defined as all fish that died within five days of the last transfer date. ODFW pathology personnel were available for specific disease problems should they become apparent in mortalities or live fish.

The total number of fish at release was estimated using ODFW Fish Liberation Reports and acclimation mortality records. The number of fish reported as tagged was estimated using ODFW Coded-Wire Tagging Operation Summaries, ODFW hatchery and acclimation mortality records, tag retention sampling just prior to release, and information on the total number of fish released.

The fish were sampled on the day of release for length frequency and weight using standard ODFW techniques. Samples from the acclimated groups were taken from the acclimation ponds and samples from the non-acclimated groups were taken directly from the fish transport trucks. Descaling indices were completed in general accordance with the techniques of Scully et al. (1984). For the criterion of severe descaling, ten potential descaled areas were identified, five from each side of the fish. Severe descaling was defined as loss of greater than 40.0% of the scales in at least two of these ten sections. Partial descaling was defined as loss of greater than 3.0% of the scales on at least one side of the fish.

Temperature and D.O. measurements that were taken at the facilities during acclimation are reported in association with each particular acclimation. Temperatures were taken with automatic digital temperature recorders (Ryan TempMentors) which recorded hourly temperatures. Dissolved oxygen measurements were taken with a Hach portable D.O. meter. Detailed temperature data are presented in Appendices A and B. Percent body weight of food to feed was determined using Bioproducts Inc. feed charts.

Outmigration Monitoring

Juvenile salmonids were collected in the trapping facility at Westland Canal (RM 27) from March 25 to July 27, 1992. The trap is approximately 36 and 54 rivermiles downstream from Minthorn and Bonifer, respectively, and is operated by CTUIR and ODFW Trap and Haul personnel.

The fish were loaded by dip net or fish pump into 370 or 3,000 gallon fish liberation units and total pounds loaded was estimated by water displacement. Using standard hatchery practices, several weight samples were taken to estimate the average size of the fish. The number of fish loaded was then calculated by multiplying the number of fish per pound by the number of pounds loaded. Species and fin marks were recorded on all fish sampled and lengths were recorded on a portion of them. Beginning on June 30, unclipped juvenile chinook were passed through a tag detector to try and distinguish naturally produced juveniles from body tagged only hatchery fish. The tag detector was not working properly on some days however, and was not used.

The fish were sampled a minimum of three days per week during periods when large numbers of fish were being trapped, and one to two days per week when the numbers were low. On days when the fish were not sampled, the numbers trapped were estimated by extrapolation.

Acclimation Research

A research program was initiated in 1987 to determine the effects of acclimating juvenile salmon and steelhead prior to release in the Umatilla River Basin. In 1992, juvenile spring chinook were adipose fin clipped and coded-wire tagged by ODFW for both 1992 and 1993 releases. Three replicate tag codes were used for each test (acclimated) and control (non-acclimated) group.

The snouts and associated biological data from adult salmonids marked to indicate the presence of coded-wire tags were collected at Three Mile Dam and Minthorn. Snouts were also collected from Umatilla River creel and spawning ground surveys conducted through other CTUIR programs. The snouts were sent to ODFW for tag removal and decoding.

Adult Survival and Umatilla River Returns

Data was accessed to compile adult survival and return information for all groups of coded-wire tagged fish released in the Umatilla River. Coded-wire tagged recoveries from 1983 to 1992 were retrieved from the Pacific States Marine Fisheries Commission (Ken Johnson, Regional Mark Processing Center). Additional Oregon and Washington freshwater recoveries from 1991 through 1992 were obtained from ODFW (Charlie Corrarino) and the Washington Department of Fisheries (Susan Markey). Some data are incomplete and

should be considered as such. All fish reported are included in this report. When no expanded coded-wire tagged recovery number was available, the observed number was used.

Expanded estimates of all recoveries in the ocean, Columbia River and Umatilla River are calculated. In instances where tagged fish were not treated the same as untagged fish (eg. tagged fish were released at a different area or time than the untagged fish), expansions were calculated only for those fish treated similarly. Releases of chinook salmon occurred as subyearling and yearling fish and for discussion of recoveries from these releases, fish recovered in the same year as release were not considered. Detailed information on recoveries is presented in Appendices C, D, E, and F.

RESULTS AND DISCUSSION

Facility Maintenance

Repair and maintenance were performed at Bonifer and Minthorn in 1992. Routine maintenance work consisted mostly of weed abatement and maintenance of the electric fence at Bonifer. At Minthorn, grates and screens at the pump intake and the head and outlet of the raceways were cleaned daily while fish were being acclimated.

Collection, Holding and Spawning of Summer Steelhead

Initially, 95 hatchery and 237 unmarked steelhead were collected for broodstock at Three Mile Dam and transported to Minthorn (Appendix G). Only 225 unmarked adults (109 males and 116 females) were saved for spawning, however (Table 5). Because the broodstock goal of 212 adults was met with unmarked fish, all hatchery fish were sacrificed for coded-wire tag recovery and twelve excess unmarked adults collected in October and November were released in the Umatilla River on the first day of spawning.

A total of 86 females and 86 males were spawned (Table 5 and Appendix H). A 3 x 3 spawning matrix was utilized whenever possible and a total of 476,871 eggs were taken with a mean fecundity of 5,545.

Unmarked broodstock were selected throughout the run to provide a representative cross-section of the population (Figure 3). The percentage of fish that were trapped each month at Three Mile Dam that were eventually spawned is shown in Table 5 and Figure 4. The percentage of females spawned ranged from 54.2% for fish collected in March to 91.7% for fish collected in February. The percentage of males spawned ranged from 75.0% for fish collected in November, February and April, to 100.0% for fish collected in January.

The percentage of fish collected each month that were spawned on individual spawn days is also shown in Table 5. The data indicates that the earlier returning fish did not necessarily spawn early. Fish collected in October and November were spawned throughout the entire spawning season. Females spawned on May 12 were represented by fish collected in every month. A lower percentage of females collected in March and April were spawned than females collected in other months. After the final spawn on May 12, 20 female and 7 male brood remained. They were loaded into a 370 gallon fish liberation unit and were transported to Meacham Creek and released. The highest percentage of these fish were from fish collected in March and April (Table 5). Seventy-one percent of the males and 70.0% of the females released were collected in March and April.

Total prespawn mortality of unmarked brood during the adult holding period was 7.6% (Table 5). In comparison, prespawn mortality at Minthorn has ranged from 10.4% in 1990-91 to 20.0 to 39.0% for the previous three return years. A total of 18 unmarked adults

Table 5. Summer steelhead broodstock collection, spawning and mortality in 1991-92. /1

Date Spawmed	Percentage of males that were collected each month that were spawned								Percentage of females that were collected each month that were spawned							
	Oct.	Nov.	Dec.	Jan.	Feb.	Ma.	Apr.		Oct.	Nov.	Dec.	Jan.	Feb.	Ma.	Apr.	
Ma 19	0.0	8.3	13.0	20.0	8.3	3.9	--		0.0	0.0	15.6	33.3	6.3	0.0	--	
Ma 26	20.0	0.0	3.5	0.0	0.0	0.0	--		16.7	0.0	3.1	0.0	0.0	0.0	--	
Apr 7	0.0	0.3	13.6	0.0	8.3	0.0	0.0		0.0	6.3	12.5	0.0	6.3	0.0	0.0	
Apr 14	0.0	6.3	6.9	0.0	6.3	3.9	0.0		0.0	6.3	6.3	0.0	6.3	4.2	0.0	
Apr 21	0.0	16.7	13.8	0.0	16.7	11.5	15.0		0.0	12.5	12.5	0.0	16.7	12.5	15.0	
Apr 26	40.0	25.0	13.6	20.0	25.0	23.1	15.0		16.7	25.0	15.6	16.7	41.7	12.5	15.0	
May 5	20.0	8.3	10.3	20.0	6.3	23.1	10.0		16.7	6.3	15.6	0.0	0.0	12.5	25.0	
May 12	0.0	0.0	6.9	40.0	0.0	11.5	35.0	Total	33.3	16.6	6.3	16.7	6.3	12.5	10.0	Total
Total Collected During Month	5	12/2	29	5	12	26	20	109	6	16/2	32	6	12	24	20	116
Total Spawmed	4	9/3	24/3	5	9	20	15/4	86	5	12/5	20	4	11/3	13	13/6	66
%	80.0	75.0	82.8	100	75.0	76.9	75.0	70.9	63.3	75.0	67.5	66.7	91.7	54.2	65.0	74.1
Prespawn Mortality	1	2	3	0	2	2	1	11	1	1	1	1	0	2	1	7
%	20.0	11.0	10.3	0.0	16.7	7.7	5.0	9.6	16.7	4.3	3.1	16.7	0.0	6.3	5.0	5.7
Excess Released	0	0	1	0	1	4	1	7	0	2	3	1	0	9	5	20
%	0.0	0.0	3.4	0.0	0.3	15.4	5.0	6.4	0.0	12.5	9.4	16.7	0.0	37.5	25.0	17.2

Revised: 2/23/92

File Name: C:\123R3\DATA\TABLE6

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- /1 All broodstock were collected at Three Mile Dam and transported to Menthorn Acclimation Facility. The table does not include hatchery fish which were collected initially but were not spawned.
- /2 The numbers collected do not include live males and when females that were collected initially but were released back into the Umatilla River on the first day of spawning. The numbers do include two females released back into the Umatilla River after completion of the spawning season.
- /3 Does not include one green fish.
- /4 Does not include three green fish.
- /5 Does not include one overripe fish that was die-died.
- /6 Does not include one fish with body eggs.

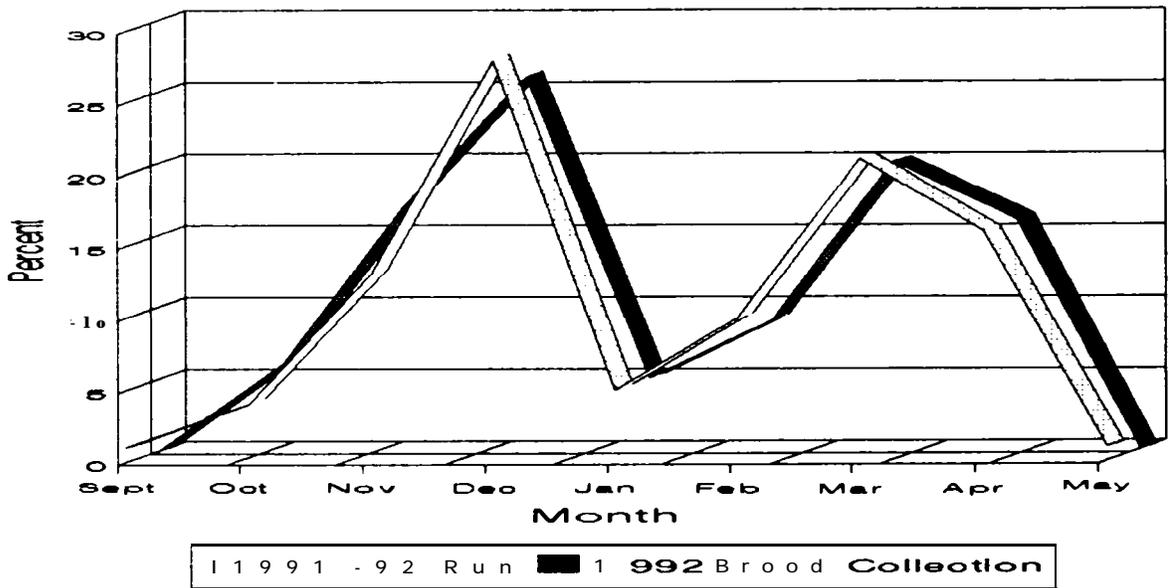


Figure 3. Return timing of summer steelhead to the Umatilla River in 1991-92 and percentage of 1992 summer steelhead broodstock collected by month.

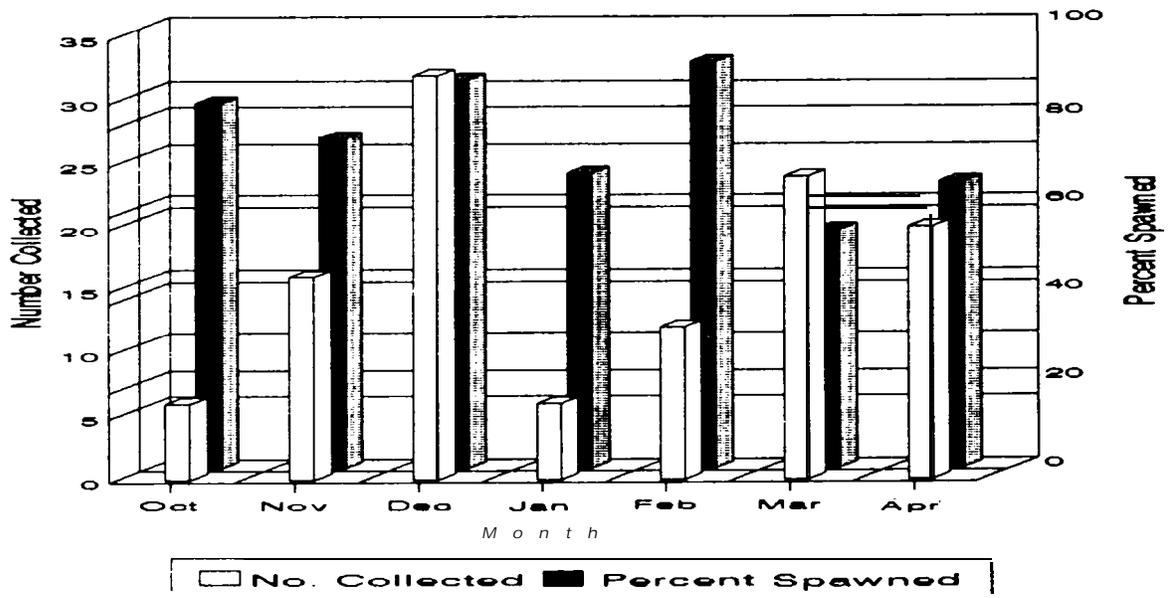


Figure 4. Percentage of unmarked female adult steelhead that were trapped each month at Threemile Dam and held for broodstock at Minthorn Acclimation Facility that were eventually spawned.

died prior to completion of spawning in 1992 and mortality was higher in males (9.6%) than it was in females (5.7%).

Collection, Holding and Spawning of Fall Chinook Salmon

A total of 211 fall chinook salmon were captured at Three Mile Dam between October 27 and November 17, 1992 and transported to Minthorn (Table 6). This included 60 females and 151 males.

Twenty males (13.3%) and no females died prior to completion of spawning (Table 6). A total of 58 females and 58 males were spawned (Table 6 and Appendix I). The mean fecundity was 3,373 and a total of 195,637 green eggs were taken. Spawning was terminated on November 17 because only one female remained and all remaining fish were sacrificed for snout and data recovery.

Disease Sampling of Summer Steelhead Broodstock

Cell culture assays for replicating agents, including IHNV virus, on spawned fish were negative (Table 7). Individual sex fluid samples from all spawned fish were tested for IHNV virus and two or three-fish tissue pools from a total of 70 females and males were also screened and negative for replicating agents. Sixty females were sampled for EIBS virus and one (1.7%) had very large inclusions in red blood cells that stained identical to those typical of EIBS inclusions although they were definitely larger. Seventy-three fish were sampled for BKD. One fish (1.4%) had a very high OD₄₀₅ reading of 2.336, indicating a high level of antigen. The other 72 fish had readings of 0.075 or less, indicating very low or negative antigen levels. The results from tests for selected pathogens from mortalities are pending.

Disease Sampling of Fall Chinook Salmon Broodstock

Cell culture assays for replicating agents, including IHNV virus, on spawned fall chinook were also negative (Table 7). Individual sex fluid samples from all spawned fish were tested for IHNV virus and two or three-fish tissue pools from 116 females and males were screened and negative for replicating agents. Fifty-six females and 56 males were sampled for EIBS virus and were negative for inclusions. One-hundred fifteen fish were sampled for BKD. One fish had a low OD₄₀₅ reading of 0.199, indicating a very low level of antigen. The other 114 fish had readings of 0.069 or less, indicating extremely low or negative antigen levels.

Adult Returns to Minthorn

A total of 523 adult hatchery steelhead returned to Three Mile Dam on the Umatilla River in 1991-92 and 315 were released upriver. Of these, three were captured at Minthorn. Three other adult steelhead were observed in Minthorn Springs Creek just below the facility,

Table 6. Fall chinook salmon broodstock collection, spawning, and mortality in 1992.

No. Collected /1			No. Spawned				Prespawn Mortality							
Males	Females	Total	Males	%	Females	%	Total	%	Males	%	Females	%	Total	%
151	60	211	58 /2	36.4	58 /3	66.7	116	55	20	13.2	0	0.0	20	9.5

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- /1 Broodstock were collected from October 27 to November 17, 1992.
One female and 71 males were sacrificed at the completion of spawning.
- /2 Does not include 2 green fish not used.
- /3 Does not include one female with bloody eggs.

Table 7. Results of disease sampling of Umatilla River summer steelhead and fall chinook salmon broodstock in 1992. /1

Species	Test	Incidence	Comments
<u>Summer Steelhead</u>			
Spawned	IINNV	0/172	
	IPNV	0/172	
	EIBS	1/60	
	BKD	1/73	One fish had a high OD405 reading (2.336), indicating a high level of antigen. The other 72 fish had low OD405 readings (0.075 or less), indicating low or negative antigen levels.
Mortality	BKD		Results pending
	Aeromonus/ Pseudomonas		Results pending
	Ceratomyxa shasta		Results pending
<u>Fall Chinook</u>			
Spawned	IHNV	0/116	
	IPNV	0/116	
	EIBS	0/112	
	BKD	1/115	One fish had a low OD405 reading (0.199), indicating a very low level of antigen. The other 114 fish had readings of 0.069 or less, indicating extremely low or negative antigen levels.

Revised: 1-19-93

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- /1 Data provided by ODFW Eastern Oregon Fish Pathology Laboratory.
All broodstock were held and spawned at Minthorn Acclimation Facility.

but it is unknown whether they were hatchery or unmarked fish. Two of the three hatchery fish captured were sacrificed for coded-wire tag recovery and the other was released back into Minthorn Springs Creek. Four redds were also observed in Minthorn Springs Creek.

Adult Returns to Bonifer

Two adult steelhead were trapped at Bonifer and released back into Meacham Creek. One was a known hatchery fish and the other was released without noting fin marks. Two adults were observed in Boston Canyon Creek at the mouth of the ladder and eight fish were observed for several days in early April at the mouth of Boston Canyon Creek.

Acclimation and Release of Juvenile Salmonids

Fall chinook salmon have been released in the Umatilla River every year since 1982 and from acclimation facilities from 1983 to 1991 (Table 8). In 1982, this release was of Tule stock. Since then, all releases have been of upriver bright stock (Table 2). This is the seventh year that spring chinook salmon from Carson have been acclimated and released (Tables 3 and 8). Summer steelhead of Skamania and Oxbow stocks were released from 1967 through 1970. In 1975, one release of Umatilla stock steelhead occurred and fish releases every year since 1981 have been from this stock (Table 1). Summer steelhead have been released from acclimation facilities since 1984 (Table 9). Coho salmon have been released since 1987, and a portion have been acclimated when the facilities and the fish were available (Tables 4 and 9).

Two groups of acclimated juvenile steelhead (67,435 fish) and one group of acclimated juvenile spring chinook (109,101 fish) were among the 6,365,285 salmon and steelhead released into the Umatilla River in 1992 (Table 10).

Acclimation at Minthorn

Summer steelhead

An acclimation study in 1992 with juvenile summer steelhead was not possible. A control group was not available because of evaluations being conducted at Umatilla Hatchery. Juveniles were graded into three size groups with approximately 70,000 fish per group and each group was reared in one of three passes in a Michigan type pond system. The largest fish were reared in the first pass, while the smallest fish were reared in the third pass.

Acclimation of juvenile steelhead in 1992 remained a high priority, however. The goal was to acclimate the largest fish, but this created a dilemma. Included in this group were coded-wire tagged fish and the individual holding capacities of Bonifer and Minthorn are inadequate to rear 70,000 fish at the release target size of 5/lb. Evaluation of adult survival would be complicated by splitting the tagged group between two acclimation

Table 8 Juvenile fall and spring chinook salmon releases in the Umatilla Rivet Basin (1982– 1992). [1]

Species	Fall Chinook				Spring Chinook		
	Lower Umatilla	Upper Umatilla	Bonifer	Minthorn	Lower Umatilla	Upper Umatilla	Bonifer
Year							
1982	3,807,171 (sy)[2]	0	0	0	0	0	0
1983	0	80,564 (y)	20,000 (y)	0	0	0	0
1984	667,190 (sy)[3]	175,104 (y)	53,308 (y)	0	0	0	0
1985	3,223,172 (sy)[3]	60,507 (y)	137,655 (y)	0	0	0	0
1986	2,029,602 (sy)[3]	0	115,779 (y)	91,036 (y)	0	300,438 (sy)	99,970 (y)
1987	1,476,830 (sy)[5]	0	102,363 (y)	111,143 [6]	0	169,100 (sy)	99,897 (y)
1988	3,316,007 (sy)[5&7]	79,681 (sy)[8]	99,550 (y)	115,199 [9]	156,312 (y)[7]	210,496 [9]	107,427 [9]
1989	3,052,015 (sy)	295,575 [9]	0	78,825 (sy)[8]	0	164,786 [9]	160,734 [9]
1990	0	255,614 (y)	0	71,864 (sy)[8]	99,775 (y)	195,425 [9]	194,783 [9]
1991	10,462 [11](sy)	3,132,127 (sy)[10]	0	79,672 (sy)	5,937 [11](y)	265,420 [9]	181,649 [9]
1992	7,837 [11](sy)	194,847 (y)	0	0	5,272 [11](y)	1,783,566 [9]	
		3,273,538 (sy)					
		220,440 (y)					
		3,182,712 [12](sy)					

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- [1] y = yearling releases; sy = subyearling releases
- [2] Releases in 1982 were Tule stock; all others have been upriver brights.
- [3] Subyearlings released below Threemile Dam to avoid loss in irrigation diversions.
- [4] Subyearlings acclimated in summer and released as yearlings in fall.
- [5] Released at Steelhead Park near Hermiston.
- [6] Includes yearling spring and approximately 2,000 subyearling summer releases.
- [7] Released below Westland Dam
- [8] Released in the fall.
- [9] Includes yearling spring and subyearling fall releases.
- [10] 76,646 were released in the fall.
- [11] Passage evaluation releases at Threemile Dam.
- [12] Released at Bamhart (RM 42).

Table 9. Juvenile steelhead and who salmon releases in the Umatilla River Basin (1981-1992) [1].

Species	Summer Steelhead				Coho		
	Lower Umatilla	Upper Umatilla	Mnthorn	Bonifer	Lower Umatilla	Upper Umatilla	Mnthorn
Year							
1961	0	17,556 (y) 9,400 (sy)	0	0	0	0	0
1962	0	59,494 (y) 67,940 (sy)	0	0	0	0	0
1963	0	60,500 (y) 52,700 (sy)	0	0	0	0	0
1984	0	0	0	57,939 (y) 22,000 (sy)	0	0	0
1965	0	0	0	53,850 (y) 39,134 (sy)	0	0	0
1966	0	0	0	54,137 (y)	0	0	0
1967	0	1,405 (y)[2]	0	0	766,660 (y)[3]	0	161,669 (y)
1988	33,984 (y)[3]	40,790 [4&5]	30,549 (y)	0	996,433 (y)[3]	0	0
1969	0	29,586 (y)	29,052 (y)	22,274 (y)	0	629,607 (y)	157,299 (y)
1990	0	29,446 (y)	0	59,747 (y)	202,315 (y)	654,209 (y)	132,404 (y)
1991	3,998 [6](y)	29,325 (y)	0	42,610 (y)	0	602,655 (y)	152,974 (y)
1992	5,443 [6](y)	131,969 (y)	47,456 (y)	19,977 (y)	0	961,366 (y)	0

Revised: 7-16-92

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- [1] y = yearling releases; sy = subyearling releases
- [2] Small release due to IHN & IPN problems in eggs.
- [3] Fish released below Westland Dam
- [4] Includes both experimental control group and gradeouts from 66 brood year.
- [5] Does not include any unfed fry that were released.
- [6] passage evaluation releases at Threemile Dam

Table 10. Juvenile salmon and steelhead released in the Umatilla River Basin in 1992.

Species	Brood	Stock	Hatchery	Number	# lbs	Location	h Facility	h River	Fish Mark /1	# Marked /2
Fall Chn	90	Bonneville	Bonneville	96479	77	Uma RM 56		March 18/19	RV only	96479
Fall Chn	90	Bonneville	Bonneville	26160	75	Uma RM 56	-----	March 19	CWT + RV	26160
Fall Chn	90	Bonneville	Bonneville	71623	7.6	Uma RM 70	-----	March 17	RV only	71623
Fall can	90	Bonneville	Bonneville	26178	7.5	Uma RM 70	-----	March 17	CWT + RV	26178
Fall Chn	91	Bonneville	Umatilla	304968	61.7	Uma RM 42	-----	May 18/20	CWT + RV	304968
Fall Chn	91	Bonneville	Umatilla	1949752	61.1	Uma RM 42	-----	May 18/20	RV only	1949752
Fall Chn	91	Bonneville	Umatilla	140149	67.7	Uma RM 42	-----	May 19/20	BT only	135619
Fall Chn	91	Bonneville	Umatilla	139250	67.8	Uma RM 42	-----	May 19/20	BT + LV	132893
Fall Chn	91	Bonneville	Umatilla	144224	67.7	Uma RM 42	-----	May 19/20	LV only	144224
Fall Chn	91	Bonneville	Umatilla	2670	112.0	Uma RM 3	April 7	April 14/May 11	RV only	2670
Fall Chn	91	Umatilla	Irrigon	504369	534	Uma RM 42	-----	May 20/21	RV only	504369
Fall Chn	91	Umatilla	Irrigon	5187	62.8	Uma RM 3	May 12	May 13/23	RV only	5167
Subtotal				3410989						
Spring Chn	90	Carson	Carson	90982	187	Uma RM 89	-----	April 14	CWT	30106
Spring Chn	90	Carson	Carson	5272	18.7	Uma RM 3	April 14	April 22/May 9	CWT	1745
Spring Chn /3	90	Lookingglass	Bonneville	109101	9.2	Bonifer (RM 2) /4	Mer 31/Apr 1	April 21	CWT	78748
Spring Chn /3	90	Lookingglass	Bonneville	98926	8.5	Meacham Creek (RM 5)	-----	April 21	CWT	76468
Spring Chn	91	Carson	Umatilla	508535	350	Uma RM 80	-----	May 11/13	CWT	508535
Spring Chn	91	Carson	Umatilla	449217	35.9	Uma RM 80	-----	May 11/13	RV only	449217
Spring Chn	91	Carson	Irrigon	294458	32.5	Uma RM 80	-----	May 13/14	RV only	294458
Spring Chn	91	Carson	Bonneville	132929 /5	11.5	Uma RM 80	-----	November 3/4	CWT	131847
Spring Chn	91	Carson	Umatilla	101416 /5	19.4	Uma RM 80	-----	November 5	CWT	51768
Subtotal				1768836						
Coho	90	Tanner Creek	Cascade	480165	157	Uma RM 60	-----	March 16/18	CWT	55163
Coho	90	Tanner oak	Cascade	472221	15.5	Uma RM 56	-----	March 18/20	CWT	27908
Subtotal				961386						
Sum. Sthd	91	Umatilla R.	Umatilla	19977	5.8	Bonifer (RM 2) /4	March 12	March 29	Adonly & CWT + LV	10737
Sum. Sthd.	91	Umatilla R.	Umatilla	47458	5.8	Minthorn (RM 63)	March 12	March 29	Adonly & CWT + LV	25507
Sum. Sthd.	01	Umatilla R.	Umatilla	64550	5.0	Meacham Creek (RM 5)	-----	April 29/30	Adonly & CWT + LV	21051
Sum. Sthd	91	Umatilla R.	Umatilla	67419	5.5	Meacham oak (RM 5)	-----	April 30/May 1	Adonly & CWT + LV	29353
Sum. Sthd.	91	Umatilla R.	Umatilla	5443	5.e	Uma RM 3	April 1	April 7/9	Adonly	36477
Subtotal				204647						30942
TOTAL				6396080						

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/1 Coded-wire tagged fish are given an adipose fin clip unless additional clips are indicated.
 /2 Number reflects tag loss but does not reflect poor fin clips.
 /3 Acclimation evaluation (an unacclimated control release occurred instream near facilities at time of acclimated release).
 /4 RM 2 of Meacham Creek or 81 river miles from the mouth of the Umatilla River.
 /5 100% RV clipped.

facilities. Acclimation was given highest priority however, and a decision was made to acclimate a portion of the fish at each location.

A group of 47,458 summer steelhead was acclimated at Minthorn for 17 days and released on March 29 at 5.8/lb. (Table 10). Included were 21,951 coded-wire tagged fish (Table 11) and 25,507 adipose clipped only fish. They were fed 1.17% BWD and total mortality was 0.13% (Table 12). The mean temperature and D.O. during acclimation was 9.0 degrees C and 7.3 mg/l, respectively (Table 12).

The length frequency distributions of the coded-wire tagged and non-tagged fish were similar (Figure 5). None of the fish sampled at release were totally descaled, but an estimated 14.7% were considered partially descaled (Table 13).

Acclimation at Bonifer

Summer steelhead

The remaining portion of fish were acclimated at Bonifer. They were also held for 17 days and released on March 29. An estimated 19,977 fish at 5.8/lb. were released (Table 10), including an estimated 9,240 coded-wire tagged fish (Table 11) and 10,737 adipose clipped only fish. They were fed 1.14% BWD and total mortality was 0.12% (Table 12). The mean temperature and D.O. was 9.5 degrees C and 9.2 mg/l, respectively (Table 12).

The length frequency distributions of the coded-wire tagged and non-tagged fish in this group were also similar (Figure 6). The percentage of fish with some descaling (16.0%) was similar to the group of fish acclimated at Minthorn (14.7%), but while none of the fish acclimated at Minthorn were totally descaled, an estimated 4.0% of the fish acclimated at Bonifer were totally descaled (Table 13).

Spring chinook salmon

On April 21, a group of 109,101 spring chinook salmon at 9.2/lb. was released from Bonifer after a 20 to 21-day acclimation period (Table 10). Included were 79,746 coded-wire tagged fish (Table 14). The fish were fed 0.95% BWD and total mortality was 0.05% (Table 12). The mean temperature and D.O. during acclimation was 10.4 degrees C and 6.7 mg/l, respectively (Table 12).

A control group of 98,928 fish at 8.5/lb. was released directly into Meacham Creek on April 21 (Table 10). Included were 76,468 coded-wire tagged fish (Table 14).

The length frequency distributions of both groups (all fish and coded-wire tagged fish only) were similar (Figures 7 and 8). The descaling indices were also similar (Table 13).

Table 11. Liberation information for summer **steelhead** coded-wire tagged and released in the **Umatilla** River Basin.

Brood	Number Released	Release Date	No./lb.	Number tagged	CWT code	Release location
87	10,187	Apr 88	7.4	9,829	073859	Minthorn
87	10,075	Apr 88	7.4	9,721	073860	Minthorn
87	<u>10,287</u>	Apr 88	7.4	<u>9,925</u>	07386 1	Minthorn
	30,549			29,475		
87	10,423	Apr 88	6.5	9,689	073856	Nr. Minthorn
87	10,171	Apr 88	6.5	9,455	073857	Nr. Minthorn
87	<u>10,163</u>	Apr 88	6.5	<u>9,448</u>	073858	Nr. Minthorn
	30,757			28,592		
88	9,949	May 89	6.6	8,784	074720	Minthorn
88	9,954	May 89	6.6	8,789	074723	Minthorn
88	<u>9,949</u>	May 89	6.6	<u>8,784</u>	074724	Minthorn
	29,852			26,357		
a8	9,873	May 89	5.6	8,800	074715	Nr. Minthorn
88	9,864	May 89	5.6	8,791	074717	Nr. Minthorn
88	<u>9,849</u>	May 89	5.6	<u>8,778</u>	074718	Nr. Minthorn
	29,586			26,369		
89	10,239	May 90	5.9	9,331	075212	Bonifer
89	10,022	May 90	5.9	9,133	075213	Bonifer
89	<u>9,964</u>	May 90	5.9	<u>9,080</u>	075214	Bonifer
	30,225			27,544		
89	9,830	May 90	5.5	9,511	075215	Nr. Bonifer
89	9,845	May 90	5.5	9,525	075216	Nr. Bonifer
89	<u>9,771</u>	May 90	5.5	<u>9,454</u>	075217	Nr. Bonifer
	29,446			28,490		
90	10,086	May 91	6.2	9,835	075340	Bonifer
90	10,070	May 91	6.2	9,819	075341	Bonifer
90	<u>10,065</u>	May 91	6.2	<u>9,814</u>	075342	Bonifer
	30,221			29,468		
90	9,754	May 91	8.7	9,432	075343	Nr. Bonifer
90	9,790	May 91	a.7	9,467	075344	Nr. Bonifer
90	<u>9,781</u>	May 91	8.7	<u>9,458</u>	075345	Nr. Bonifer
	29,325			28,357		

Revised: 7-28-92

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Table 11. (Cont.)

Brood	Number Released	Release Date	No./lb.	Number tagged	CWT code	Release location
91	22,474	March 92	5.8	10,394	073759	Bonifer/Minthorn
91	22,902	March 92	5.8	10,594	073862	Bonifer/Minthorn
91	22,059	March 92	5.8	10,203	074 127	Bonifer/Minthorn
	67,435			31,191		
91	22,262	April 92	5.0	10,108	075841	Meacham Creek
91	21,365	April 92	5.0	9,498	075642	Meacham Creek
91	20,923	April 92	5.0	9,747	075843	Meacham Creek
	64,550			29,353		
91	22,469	April/May 92	5.5	10,562	075838	Meacham Creek
91	22,662	April/May 92	5.5	10,275	075839	Meacham Creek
91	22,288	April/May 92	5.5	10,105	075840	Meacham Creek
	67,419			30,942		

Revised: 7-28-92

File Name: C:\123R3\DATA\92STSREL

Table 12. Food rations, mortalities, temperatures, and D.O. concentrations during acclimation of juvenile salmonids at Bonifer and Minthorn Acclimation Facilities in 1992.

Species	Release Location	Release Date	Days Held	Food Fed (%/day)	Mortality			Temperature (C)			D.O. (mg/l)		
					5	by	Total %	Min	Max.	Mean	Min.	Max.	Mean
Summer Steelhead	Minthorn	March 29	17	1.17	34	61	0.13	6.3	11.9	9.0	6.5	6.5	7.3
Summer Steelhead	Bonifer	March 29	17	1.14	1	25	0.12	6.4	14.4	9.5	7.1	10.6	9.2
Spring Chinook	Bonifer	April 21	20-21	0.95	20	51	0.05	7.4	14.0	10.4	5.3	7.6	6.7

Revised: 7-23-92

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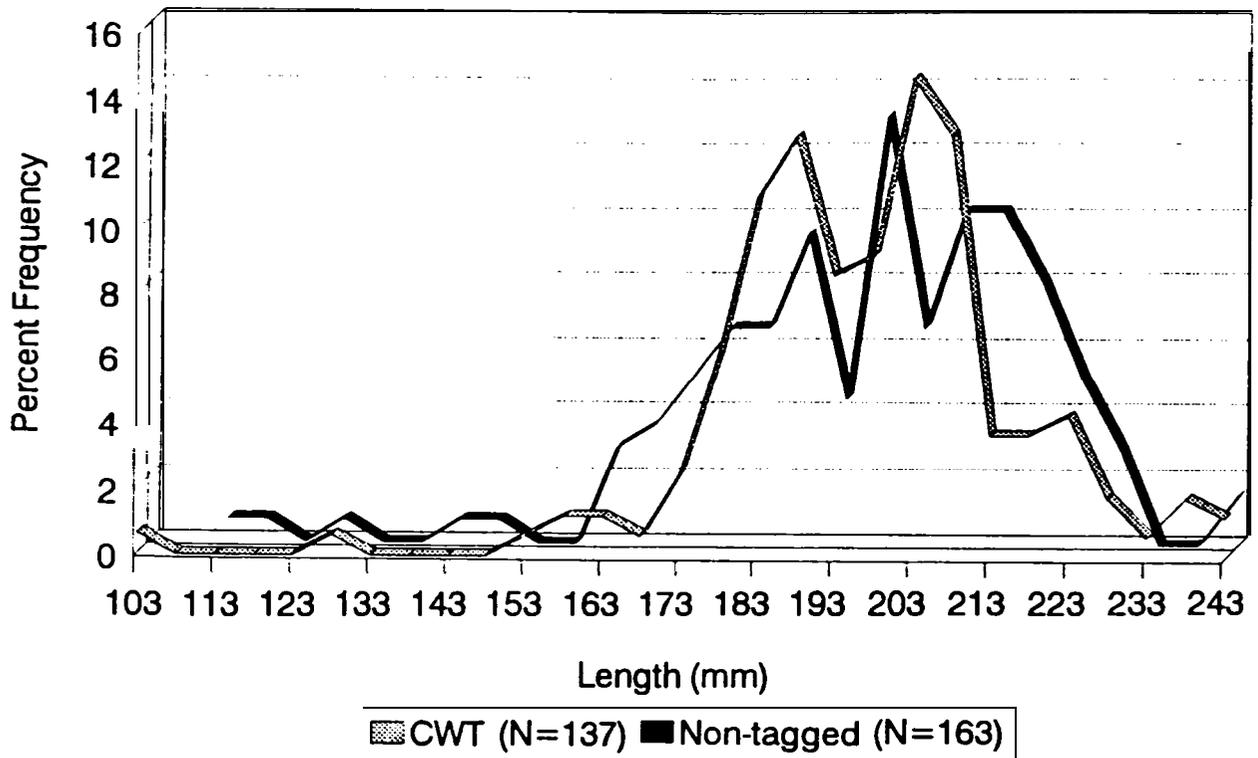


Figure 5. Length frequencies of coded-wire tagged and non-tagged summer steelhead released at Minthorn Acclimation Facility on 3/29/92.

Table 13. Size and descaling data for juvenile salmonids released in the Umatilla River Basin in 1991.

Species	Group	Release Location	Release Date	Days Held	No./lb.		Fork Ln. (mm)		Descaling (%)			N
					Mean	Std.	Mean	Std.	Total	Partial	None	
Summer Steelhead	Acc.	Minthorn	March 29	17	5.0	3.7	197	20	0.0	14.7	65.3	300
Summer Steelhead	Acc.	Bonifer	March 29	17	5.0	2.1	198	19	4.0	12.0	84.0	300
Spring Chinook	Acc.	Bonifer	April 21	20-21	9.2	3.3	162	19	2.3	3.0	94.7	300
	control	Nr. Bonifer	April 21		0.5	3.3	164	21	0.3	6.7	93.0	300

Revised: 7-23-92

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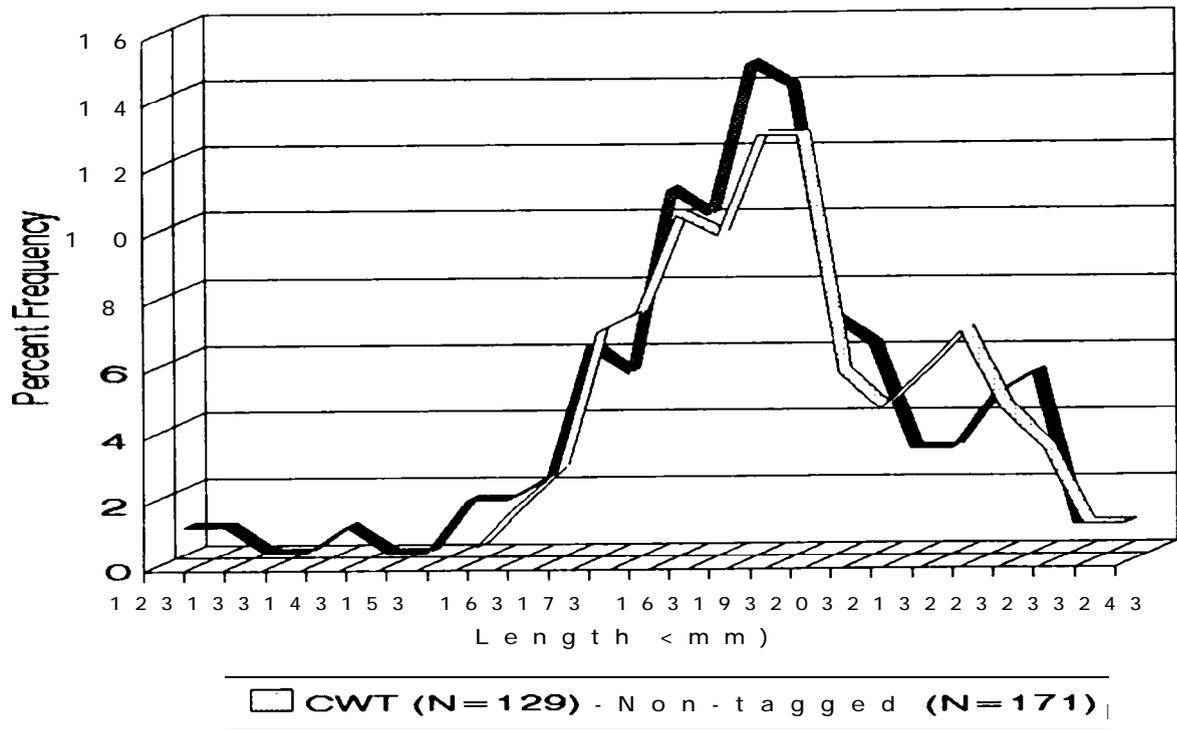


Figure 6. Length frequencies of coded-wire tagged and non-tagged summer steelhead released at Bonifer Acclimation Facility on 3/29/92.

Table 14. Liberation information for spring chinook salmon coded-wire tagged and released in the Umatilla River Basin.

Brood	Number Released	Release Date	No./lb.	Number tagged	CWT code	Release location
86	35,946	Mar-Apr 88	10.1	26,640	074325	Bonifer
86	35,146	Mar-Apr 88	10.1	25,663	074326	Bonifer
86	35,137	Mar-Apr 88	10.1	25,653	074327	Bonifer
	106,231			70,356		
86	34,167	Apr 88	8.6	26,319	074328	Uma RM 23-01
86	33,573	Apr 88	8.6	25,722	074329	Uma RM 23-81
86	34,116	Apr 88	8.6	26,252	074330	Uma RM 23-81
	101,676			78,293		
87	416	Nov 88	21.4	410	074420	Bonifer
87	399	Nov 88	21.4	393	074423	Bonifer
87	361	Nov 88	21.4	376	074424	Bonifer
	1,196			1,179		
87	26,109	Nov 88	11.1	25,987	074427	Uma RM 89
87	24,163	Nov 88	11.1	24,070	074429	Uma RM 89
87	25,475	Nov 88	11.1	25,356	074430	Uma RM 89
	75,767			75,413		
87	26,135	Mar-May 89	10.6	25,427	074433	Bonifer
87	27,756	Mar-May 89	10.6	27,004	074434	Bonifer
87	26,093	Mar-May 89	10.6	25,386	074436	Bonifer
	79,984			77,617		
87	26,153	Mar 89	10.6	27,5%	074439	Nr. Bonifer
87	28,116	Mar 89	10.6	27,550	074440	Nr. Bonifer
a7	24,663	Mar 89	10.6	24,165	074443	Nr. Bonifer
	80,932			79,300		
88	24,968	Oct 89	12.0	24,601	075063	Bonifer
88	28,299	Oct 89	12.0	28,109	075101	Bonifer
88	27,463	Oct 89	12.0	27,299	075102	Bonifer
	80,750			80,209		
88	27,207	Oct 89	12.0	27,137	075103	Nr. Bonifer
88	26,716	Oct 89	12.0	28,560	075104	Nr. Bonifer
88	27,646	Oct 89	12.0	27,6%	075105	Nr. Bonifer
	83,853			83,392		
88	38,224	March 90	9.0	26,638	075106	Bonifer
88	37,538	March 90	9.0	26,160	075107	Bonifer
88	38,583	March 90	9.0	26,888	075108	Bonifer
	114,345			79,686		
88	39,012	March 90	9.6	25,611	075109	Nr. Bonifer
88	40,072	March 90	9.6	26,307	075110	Nr. Bonifer
88	38,343	March 90	9.6	25,172	075111	Nr. Bonifer
	117,427			77,090		
89	26,757	Oct 90	11.5	26,670	074505	Bonifer
89	26,806	Oct 90	11.5	26,717	074506	Bonifer
89	26,876	Oct 90	11.5	26,788	074917	Bonifer
	80,438			80,175		
89	26,050	Oct 90	13.4	25,676	074508	Nr. Bonifer
89	26,279	Oct 90	13.4	26,104	074509	Nr. Bonifer
89	25,669	Oct 90	13.4	25,497	074510	Nr. Bonifer
	77,998			77,477		

Revised: 7-16-92

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Table 14. (cont.)

Brood	Number Released	Release Date	No./No.	Number tagged	CWT code	Release location
89	33,473	Mar 91	10.1	25,947	075114	Bonifer
89	33,440	Mar 91	10.1	25,921	075115	Bonifer
89	<u>33,593</u>	Mar 91	10.1	<u>26,039</u>	075116	Bonifer
	100,506			77,907		
89	31,932	Mar 91	11.8	24,366	075440	Nr. Bonifer
89	32,187	Mar 91	11.8	24,559	075441	Nr. Bonifer
89	<u>32,032</u>	Mar 91	11.8	<u>24,441</u>	075442	Nr. Bonifer
	96,152			73,366		
90	27,040	Nov 91	16.5	26,769	075826	Bonifer
90	27,007	Nov 91	16.5	26,737	075827	Bonifer
90	<u>27,638</u>	Nov 91	16.5	<u>26,827</u>	075828	Bonifer
	81,144			80,333		
90	26,019	Nov 91	16.8	25,499	075829	Nr. Bonifer
90	25,900	Nov 91	16.8	25,382	075830	Nr. Bonifer
90	<u>26,561</u>	Nov 91	16.8	<u>26,029</u>	075831	Nr. Bonifer
	78,480			76,910		
90	90,982	April 92	18.7	30,106	633962	Uma RM 89
90	<u>5,272</u>	April 92	18.7	<u>1,745</u>	633962	Uma RM 3
	96,254			31,851		
90	33,351	April 92	9.2	26,570	075836	Bonifer
90	36,154	April 92	9.2	26,426	075836	Bonifer
90	<u>36,596</u>	April 92	9.2	<u>26,750</u>	075837	Bonifer
	109,101			79,746		
90	32,994	April 92	8.5	25,503	075832	Nr. Bonifer
90	32,963	April 92	8.5	25,472	075833	Nr. Bonifer
90	<u>32,982</u>	April 92	8.5	<u>25,943</u>	075834	Nr. Bonifer
	98,928			76,468		
91	25,104	Nov 92	13.0	25,104	076042	Uma RM 80
91	25,075	Nov 92	13.0	24,992	076043	Uma RM 80
91	15,730	Nov 92	13.1	15,423	076044	Uma RM 80
91	24,638	Nov 92	9.9	24,638	076045	Uma RM 80
91	24,715	Nov 92	10.0	24,221	076046	Uma RM 80
91	<u>17,667</u>	Nov 92	10.1	<u>17,269</u>	076047	Uma RM 80
	132,929			a1. 647		
91	x. 733	Nov 92	19.3	26,135	071542	Uma RM 80
91	<u>50,680</u>	Nov 92	19.5	<u>25,633</u>	071543	Uma RM 80
	101,416			51,768		
91	97,013	May 92	32.1	50,611	071443	Uma RM 80
91	63,585	May 92	31.2	48,051	071444	Uma RM 80
91	63,305	May 92	32.2	49,498	071440	Uma RM 80
91	96,456	May 92	32.1	50,046	071446	Uma RM 80
91	104,670	May 92	36.4	50,047	071447	Uma RM 80
91	104,929	May 92	36.3	51,707	071448	Uma RM 80
91	109,528	May 92	38.3	51,518	071449	Uma RM 80
91	109,997	May 92	37.8	51,271	071450	Uma RM 80
91	98,617	May 92	39.2	52,128	071461	Uma RM 80
91	<u>108,662</u>	May 92	36.8	<u>51,669</u>	071462	Uma RM 80
	955,752			506,535		

Revised: 6-11-93

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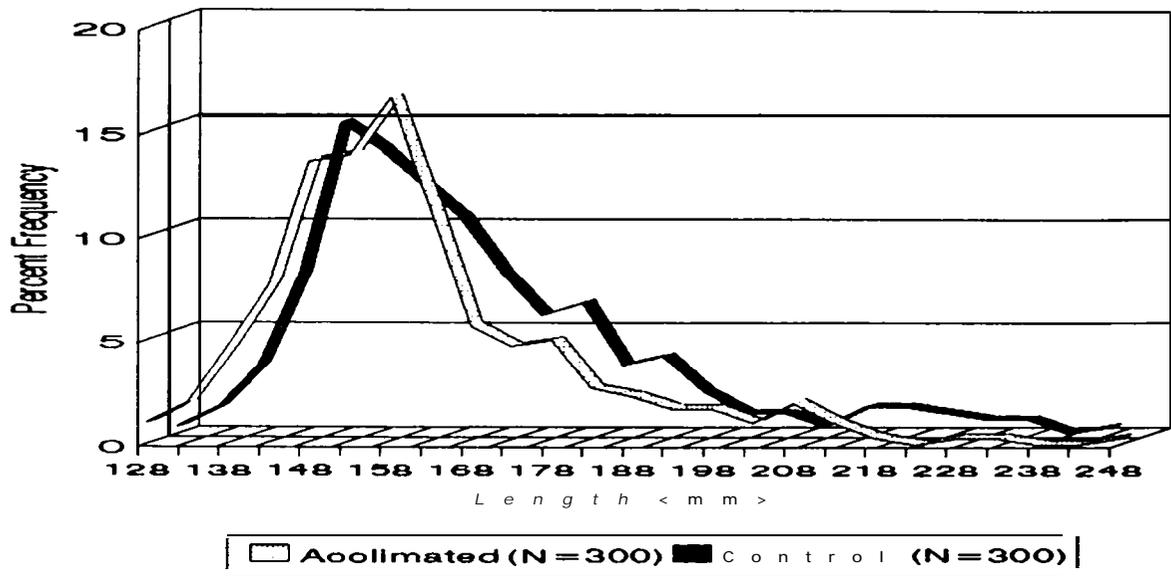


Figure 7. Length frequencies of experimental groups of spring chinook salmon released at Bonifer Acclimation Facility on 4/21/92 (acclimated versus control group - all fish).

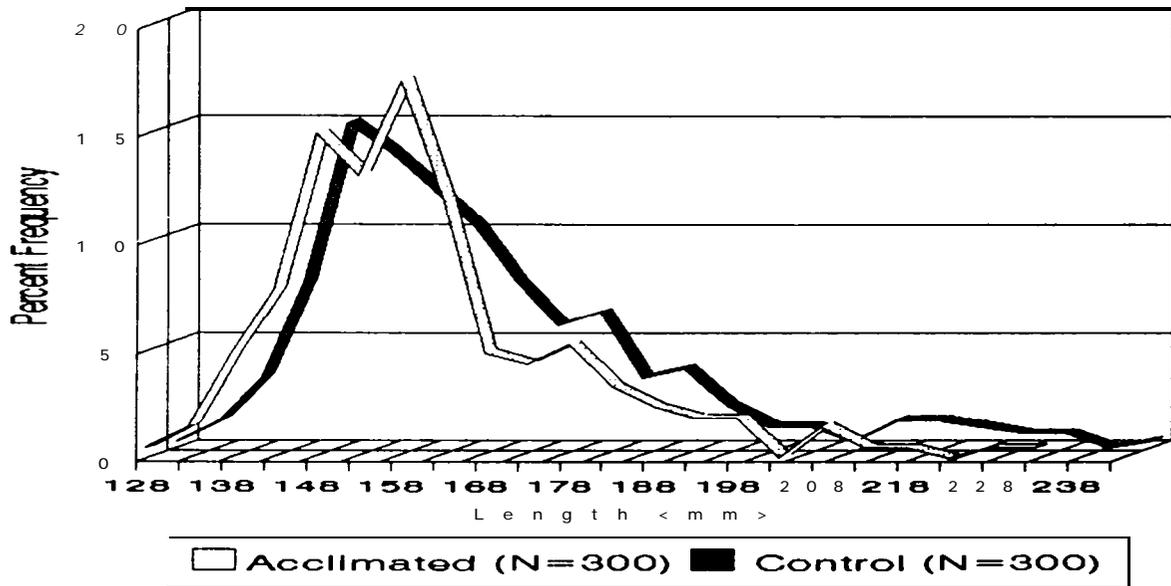


Figure 8. Length frequencies of experimental groups of spring chinook salmon released at Bonifer Acclimation Facility on 4/21/92 (acclimated versus control group - coded-wire tagged fish).

Direct Stream Releases

Additional groups of juvenile steelhead and spring chinook salmon were coded-wire tagged and released directly into Meacham Creek and the Umatilla River, respectively (Tables 11 and 14). One group of subyearling spring chinook was tagged for stock identification, while all other groups were tagged as part of the Umatilla Hatchery Monitoring and Evaluation Program. Groups of coho and fall chinook salmon were also coded-wire tagged and released directly into the Umatilla River (Tables 15 and 16, respectively). The coho and one group of fall chinook yearlings were tagged for stock identification, while all other groups were tagged as part of the Umatilla Hatchery Monitoring and Evaluation Program.

Outmigration Monitoring

Juvenile salmonids were trapped and sampled during low flow periods at the Westland Canal fish trapping facility from March 25 to July 27, 1992 (Appendix J). Twice during this period (April 14 to April 26 and May 23 to May 31), high river flows allowed the juveniles to be bypassed. Species, marks, and fork lengths were recorded for comparison to release data to give an indication of outmigration timing and size.

Right ventral (RV) fin clipped spring and fall chinook subyearlings were released into the upper Umatilla River beginning on May 11 and 18, respectively. From May 19 to May 22, length was used to separate the two races. The average size at release of the fall chinook groups ranged from 53.4 to 67.8/lb. and length frequency data indicated that the maximum length was approximately 100mm (M. L. Keefe, personal communication). Individual lengths were not taken on the spring chinook, but the average size at release (18.7/lb.) was significantly larger. All RV clipped fish that measured 100mm or less were therefore recorded as fall chinook, while fish that measured greater than 100mm were considered spring chinook.

The trap was closed from May 23 through June 2. After it was reopened on June 3 however, length could no longer be used to separate the races because the fall chinook appeared to have grown substantially. From June 3 until the close of the trap on July 27, the only chinook in the river with adipose only clips were spring chinook subyearlings. Because right ventral clipped spring chinook were released with the adipose clipped fish at a ratio of approximately 1.3:1, it was assumed that for every adipose clipped fish sampled, 1.3 RV clipped fish sampled were spring chinook and the remaining RV clipped fish were fall chinook.

Naturally produced chinook and coho salmon were also monitored at Westland. Prior to fall chinook subyearlings being released on May 18, lengths and fin marks were used to separate naturally produced chinook from hatchery releases. Approximately 93.6% of the estimated 1,769,661 chinook salmon released into the upper Umatilla River before May 18 were marked. The length frequency distribution of these fish indicated a minimum

Table 15. Liberation information for coho salmon coded-wire tagged and released in the Umatilla River Basin.

Brood	Number Released	Release Date	No./lb.	Number tagged	CWT code	Release location
85	37,245	April 87	13.5	13,440	073617	Minthorn
85	53,754	April 87	13.5	19,879	073624	Minthorn
85	<u>70,890</u>	April 87	13.5	<u>26,740</u>	073625	Minthorn
	161,889			60,059		
86	68,208	March 88	16.8	20,592	074356	LUmaR
86	73,650	March 88	17.3	18,963	074357	LUmaR
86	<u>61,666</u>	March 88	15.7	<u>18,513</u>	074358	LUmaR
	203,464			58,068		
87	75,970	March 89	17.2	27,062	074609	Nr Minthorn
87	72,627	March 89	17.3	26,416	074610	Minthorn
87	<u>84,672</u>	March 89	19.1	<u>26,739</u>	074611	Minthorn
	233,269			80,217		
88	67,309	March 90	13.5	28,033	074814	Minthorn
88	59,682	March 90	13.3	26,881	074813	Nr Minthorn
88	<u>65,095</u>	April 90	11.2	<u>27,226</u>	0748 15	Minthorn
	192,086			82,140		
89	152,974	March 91	15.4	24,584	075535	Minthorn
89	449,678	March 91	16.5	25,905	075534	Uma RM 56-60
89	<u>352,977</u>	March 91	16.8	<u>24,851</u>	075533	Uma RM 63-70
	955,629			75,340		
90	472,221	March 92	15.5	27,908	075620	Uma RM 56
90	244,615	March 92	15.7	27,705	075621	Uma RM 60
90	<u>244,550</u>	March 92	15.7	<u>27,458</u>	075622	Uma RM 60
	961,386			83,071		

Revised: 7-16-92

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Table 16. Liberation information for fall chinook salmon coded—wire tagged and released in the Umatilla River Basin.

Brood	Number Released	Release Date	No./lb.	Number tagged	CWT code	Release location
86	52,317	Mar 88	8.8	42,068	074038	Minthorn
86	48,474	Mar 88	8.8	38,978	074039	Minthorn
	100,791			81,046		
86	50,480	Mar 88	10.2	39,509	074036	Bonifer
86	49,070	Mar 88	10.2	38,405	074037	Bonifer
	99,550			77,914		
87	1,886,757	May 88	68.3	198,285	075007	Uma RM 23
87	4,823	Nov 88	9.8	4,438	074539	Minthorn
87	4,660	Nov 88	9.8	4,289	074540	Minthorn
87	4,925	Nov 88	9.8	4,533	074541	Minthorn
	14,408			13,260		
87	26,858	Nov 88	8.6	24,656	074536	Nr Minthorn
87	25,493	Nov 88	8.6	23,403	074537	Nr Minthorn
87	27,330	Nov 88	8.6	25,089	074538	Nr Minthorn
	79,681			73,148		
88	797,904	May 89	66.6	52,228	074646	Uma RM 23
88	797,903	May 89	66.6	49,771	074647	Uma RM 23
88	797,903	May 89	66.6	52,244	074648	Uma RM 23
	2,393,710			154,243		
88	26,770	Oct 89	10.9	26,358	074753	Minthorn
88	26,617	Oct 89	10.9	25,028	074754	Minthorn
88	25,438	Oct 89	10.9	25,438	074757	Minthorn
	78,825			76,824		
88	27,071	Oct 89	11.1	26,790	074758	Nr Minthorn
88	25,428	Oct 89	11.1	24,285	074760	Nr Minthorn
88	25,633	Oct 89	11.1	25,350	074763	Nr Minthorn
	78,132			76,425		
89	808,560	May–Jun 90	87.5	52,965	075403	Uma RM 70–79
89	808,560	May–Jun 90	87.5	52,965	075404	Uma RM 70–79
89	808,561	May–Jun 90	87.5	52,965	075405	Uma RM 70–79
	2,425,681			158,895		
89	25,311	Oct 90	9.2	23,396	075325	Minthorn
89	23,724	Oct 90	9.2	21,929	075326	Minthorn
89	22,828	Oct 90	9.2	21,101	075327	Minthorn
	71,863			66,426		
89	25,472	Oct 90	8.8	23,413	075322	Nr Minthorn
89	25,694	Oct 90	8.8	23,617	075323	Nr Minthorn
89	25,480	Oct 90	8.8	23,420	075324	Nr Minthorn
	76,646			70,450		

Table 16. (cont.)

Brood	Number Released	Release Date	No./lb.	Number tagged	CWT code	Release location
90	53,864	May 91	82.0	52,252	075225	Uma RM 70
90	53,595	May 91	82.0	51,728	075226	Uma RM 70
90	50,442	May 91	73.0	48,266	075328	Uma RM 70
90	50,101	May 91	73.0	48,481	075449	Uma RM 70
90	49,732	May 91	73.0	48,301	070016	Uma RM 70
90	52,326	May 91	82.0	51,814	075450	Uma RM 70
90	<u>52,706</u>	May 91	82.0	<u>52,444</u>	075451	Uma RM 70
	362,766			353,286		
90	26,481	May 91	80.5	26,173	075563	Minthorn
90	26,585	May 91	80.5	24,762	075601	Minthorn
90	<u>26,606</u>	May 91	80.5	<u>25,476</u>	075602	Minthorn
	79,672			76,411		
90	25,862	May 91	86.0	25,720	075560	Nr Minthorn
90	25,708	May 91	86.0	25,425	075561	Nr Minthorn
90	<u>23,295</u>	May 91	86.0	<u>22,309</u>	075562	Nr Minthorn
	74,865			73,454		
90	122,639	Mar 92	7.7	26,160	075619	Uma RM 56
90	<u>97,801</u>	Mar 92	7.6	<u>26,178</u>	075618	Uma RM 70
	220,440			52,338		
91	286,578	May 92	70.6	31,892	071429	Uma RM 42.5
91	281,350	May 92	65.1	32,287	071430	Uma RM 42.5
91	182,931	May 92	56.2	28,951	071431	Uma RM 42.5
91	191,257	May 92	58.3	29,425	071432	Uma RM 42.5
91	303,878	May 92	61.0	29,066	071433	Uma RM 42.5
91	306,802	May 92	65.7	31,224	071434	Uma RM 42.5
91	297,331	May 92	60.9	30,326	071435	Uma RM 42.5
91	302,555	May 92	61.9	30,365	071436	Uma RM 42.5
91	223,830	May 92	55.2	30,508	071437	Uma RM 42.5
91	<u>301,831</u>	May 92	64.5	<u>30,924</u>	071438	Uma RM 42.5
	2,678,343			304,968		

Revised: 7-16-92

File Name: C:\123R3\DATA\CHFREL92

fork length of approximately 130mm. Assuming the unmarked releases were similar in size, all unmarked fish less than 130mm in length were considered to be from natural production. On May 19, four unmarked chinook were sampled. They were all less than 82mm in length and were assumed to be from natural production. The first unmarked fall chinook subyearlings were released on this day, but they would not have had sufficient time to reach Westland prior to the fish being sampled.

Beginning on June 3, it was impossible to separate the naturally produced chinook from hatchery releases. The origin of these fish was recorded as unknown (Table 17 and Appendix J).

Table 17. Estimated number of fish captured at the Westland Canal fish tapping facility 7 /1.

Salmonids																		
All Species /2				Hatchery Production									Natural Production				Hatchery Releases	
Date	Lbs.	No./lb.	Number	Coho (Y)	Fall Chinook (Y)	Spring Chinook (Y)	Fall Chinook (SY)	Spring Chinook (SY)	STS (Y)	Chinook (Y + SY)	STS (Y)	STS (SY)	Coho (Y)	Coho (SY)	Chinook (Y)	Chinook (SY)	Total Salmonids	Hatchery Releases Only
3-25	500	14.3	7150	5270	1535	0	0	0	0	--	21	0	0	0	189	0	7023	6613
3-26	350	13.9	4665	3635	1084	0	0	0	0	--	7	0	0	0	97	0	4622	4716
3-27	300	13.4	4020	3039	920	0	0	0	0	--	0	0	0	0	54	0	4021	3967
3-26	300	126	3640	2551	1173	0	0	0	0	--	3	0	0	0	114	0	3641	3724
3-29	not hauled																	
3-30	300	115	3450	1661	1568	0	0	0	0	--	6	0	0	0	214	0	3450	3228
3-31	100	10.9	1090	425	577	0	0	0	0	--	3	0	0	0	65	0	1090	1001
4-1	420	10.3	4326	1290	2611	0	0	0	0	--	16	0	0	0	409	0	4326	3901
4-2	900	12.1	10890	5925	4235	0	0	0	0	--	33	0	0	0	697	0	10890	10161
4-3	900	13.9	12510	9883	2160	0	0	0	0	--	30	0	0	0	418	0	12511	12063
4-4	800	123	9640	6177	3170	0	0	0	0	--	190	0	0	0	304	0	9641	8346
4-5	not hauled - very few fish																	
4-6	not hauled - very few fish																	
4-7	250	7.7	1925	271	1474	0	0	0	0	--	135	0	0	0	45	0	1925	1745
4-8	not hauled																	
4-9	100	12.1	1210	742	300	0	0	0	0	--	39	0	0	0	119	0	1200	1042
4-10	1000	12.2	12200	7114	4712	0	0	0	0	--	0	0	0	0	218	0	12044	11626
4-11	1250	11.6	14500	7722	5997	0	0	0	0	--	140	0	0	0	501	0	14360	13719
4-12	not hauled - very few fish																	
4-13	3800	10.5	39900	17156	16715	0	0	0	0	--	1170	0	0	0	2729	0	39770	35671
4-20	1550	11.6	16290	13212	819	3057	0	0	0	--	546	0	0	55	491	0	16160	17066
4-29	2750	13.0	35750	29994	1212	3737	0	0	101	--	303	0	0	0	404	0	35751	35044
4-30	2220	12.6	27972	25311	273	1569	0	0	136	--	341	0	0	0	136	0	27766	27209
5-1	780	10.0	7600	5697	76	612	0	0	459	--	916	0	0	0	0	0	7762	6644
5-2	450	105	4725	3697	45	305	0	0	238	--	410	0	0	0	0	0	4695	4285
5-3	100	11.1	1110	926	10	56	0	0	46	--	61	0	0	0	0	0	1101	1040
5-4	4300	11.7	50310	44669	457	1629	0	0	1677	--	1220	0	0	0	0	0	49652	46632
5-5	4900	10.8	52820	44424	339	1061	0	0	4930	--	1629	0	0	0	197	99	52680	50755
5-6	5165	9.9	51332	40606	192	192	0	0	7053	--	1915	0	0	0	363	192	51333	46643
5-7	2850	6.2	17670	7266	0	167	0	0	6677	--	1005	0	0	84	0	0	17419	16330
5-8	3000	7.8	23400	13493	0	189	0	0	7920	--	1415	0	0	0	109	94	23306	21608
5-9	1960	71	14058	5598	0	97	0	0	6555	--	1092	0	0	63	369	80	13874	12250
5-10	1150	64	7360	1578	0	42	0	0	4399	--	702	0	0	67	353	54	7195	6019
5-11	1200	5.6	6960	251	0	31	0	0	5048	--	764	0	0	94	470	63	6741	5330
5-12	not hauled - very few fish																	
5-13	050	7.6	6630	1540	0	26	0	1044	2871	--	416	0	0	26	496	26	6447	5481
5-14	1650	30.2	49830	2061	0	0	0	46073	694	--	58	0	0	116	009	0	49631	46640
5-14	3000 lbs. of morts removed from pond in P.M																	
5-15	5550	27.1	150405	0960	0	256	0	134775	3075	--	1261	0	0	0	1794	256	150405	147074
5-16	5300	24.0	127200	6160	0	235	0	110524	7765	--	es6	0	0	0	1376	145	127200	124683
5-17	7200	20.9	150480	5552	0	300	0	126537	15480	--	1071	0	0	0	1456	85	150480	147889

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Table 17. (Cont.)

Date	All Species /2		Salmonids														Total Salmonids	Hatchery Releases	
	Lbs	No./lb	Number	Hatchery Production							Natural Production								
				Coho	Fall Chinook (Y)	Spring Chinook (Y)	Fall Chinook (SY)	Spring Chinook (SY)	STS (Y)	Chinook (Y-SY)	STS (Y)	STS (SY)	Coho (Y)	Coho (SY)	Chinook (Y)	Chinook (SY)			
5-18	3050	17.0	54290	1395	0	116	0	44176	7769	--	349	0	0	0	465	0	54290	53476	
5-19	not hauled - trap closed to allow Coho to imprint																		
5-20	10105	55.7	562649	2460	0	0	521317	35333	3099	--	620	0	0	0	0	0	562649	562229	
5-21	9810	576	565056	2311	0	0	535680	23066	3666	--	311	0	0	0	0	0	565056	664745	
5-22	8110	59.4	461734	1618	0	0	467191	9089	3636	--	0	0	0	0	0	0	461734	401734	
6-3	345	38.3	13214	420	0	0	9491	2296	196	700	0	0	0	28	0	0	13131	12403	
6-4	320	43.0	13760	178	0	0	11274	1731	69	422	22	0	22	0	0	0	13738	13272	
6-5	not hauled																		
6-6	not hauled																		
6-7	700	45.4	31760	231	0	0	27493	2447	51	1476	13	0	13	43	0	0	31768	30222	
6-8	520	46.2	24024	129	0	0	21150	1459	0	1244	0	0	0	43	0	0	24025	22738	
6-9	420	45.1	18942	110	0	0	16953	840	0	1004	0	0	0	23	0	0	18929	17902	
6-10	not hauled																		
6-11	850	43.0	36550	243	0	0	33795	405	0	2026	0	0	0	0	0	0	36469	34443	
6-12	not hauled																		
6-13	not hauled																		
6-14	not hauled																		
6-15	330	42.5	14025	99	0	0	12910	173	0	793	0	0	0	25	0	0	14000	13162	
6-16	300	3.39	11670	57	0	0	10769	103	0	704	0	0	0	10	0	0	11644	10829	
6-17	525	35.2	18480	49	0	0	17096	99	0	1166	0	0	0	0	0	0	18430	17244	
6-18	300	356	10740	14	0	0	9819	109	12	713	0	0	12	23	0	0	10703	9935	
6-19	395	36.4	14378	0	0	0	12990	216	31	987	0	0	31	62	0	0	14317	13237	
6-20	not hauled																		
6-21	200	35.5	7100	0	0	0	6291	53	24	680	0	0	8	40	0	0	7076	6366	
6-22	190	35.1	6669	0	0	0	5851	25	26	701	0	0	4	42	0	0	6650	5902	
6-23	70	34.7	2429	0	0	0	2110	0	11	265	0	0	0	17	0	0	2423	2121	
6-24	not hauled																		
6-25	95	33.9	3221	0	0	0	2689	0	13	415	0	0	0	24	0	0	3140	2702	
6-26	24	33.5	804	0	0	0	658	0	3	108	0	0	0	6	0	0	775	661	
6-27	not hauled																		
6-28	not hauled																		
6-29	not hauled																		
6-30	95	38.7	3677	6	0	0	2631	0	6	262	0	16	0	72	0	0	3017	2647	
7-1	not hauled																		
7-2	40	34.4	1376	4	0	0	985	0	0	202	0	4	0	16	0	0	1211	989	
7-3	not hauled																		
7-4	not hauled																		
7-5	not hauled																		
7-6	30	33.7	1011	0	0	0	704	0	0	240	0	0	12	6	0	0	964	704	
7-7	not hauled																		
7-8	not hauled																		

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Prior to the trap being closed on May 23, size was also used to separate naturally produced chinook yearlings from subyearlings. This separation was highly subjective but there appeared to be a distinct separation in the size of the fish. All fish recorded as subyearlings ranged from 47 to 68mm in length, while the fish that were recorded as yearlings had a minimum fork length of 81mm. The size of these larger fish and the degree of smolting suggests that they were outmigrating yearling spring chinook.

Coho Yearlings

Juvenile yearling coho released in the Umatilla River (RM 56 and 60) between March 16 and March 20, were captured at Westland (RM 27) on March 25, the first day the trap was in operation (Table 17). Increased seagull activity between Westland and Three Mile Dam on March 19 however, suggests that some fish may have passed Westland before the trap was opened. The number of fish captured continued to increase until the trap was closed on April 14. When the trap was reopened on April 27, substantial numbers were again captured. This data and visual observations of large numbers of coho at Three Mile Dam indicate that numerous fish bypassed the facility during the closure period. The number of fish captured remained high through the first week in May, and then steadily declined until the trap was closed again on May 23. After the trap was reopened on June 1, very few fish were observed (Appendix J). Only three fish were sampled from June 17 to July 2 .

The peak outmigration period (middle of April through first week in May) was approximately four to seven weeks after the fish were released. Visual observations of coho yearlings captured at Westland suggest that they were released early and/or at a small size (15.6/lb.). Parr marks were highly visible on fish captured in March and early April. In contrast, the fish captured in late April and early May were silvery with no distinct parr marks. An estimated 35.7% of the 961,386 summer steelhead smolts released in the upper Umatilla River were trapped and hauled.

Fall Chinook Yearlings

Fall chinook yearlings released in the Umatilla River (RM 56 and 70) between March 17 and March 19, were also captured at Westland on March 25 (Table 17), although some may have passed the facility before the trap was opened. The number of fish captured continued to increase until the trap was closed on April 14. Unlike the coho however, very few fall chinook yearlings were captured when the trap was reopened on April 27. Visual observations of large numbers of chinook yearlings at Three Mile Dam confirmed that numerous fish bypassed the facility during the closure period. The last fish observed at Westland was on May 6 and only 37 fish were sampled from April 28 to May 6 (Appendix J).

The peak outmigration period for fall chinook yearlings appeared to be the last two weeks in April. This was approximately four to six week after release. Although there were

no visually apparent morphological differences in the fish trapped at Westland, the fall chinook yearlings may have been released early as well. An estimated 24.4% of the 220,440 fall chinook yearlings released were trapped and hauled.

Summer Steel head

Groups of summer steelhead were released from Bonifer and Minthorn on March 29, and into Meacham Creek between April 29 and May 1. The first fish observed at Westland was on April 29 (Table 17 and Appendix J). Some fish could have passed the facility prior to the trap being reopened on April 27, but the number, if any, is assumed to be extremely low. No steelhead were sampled on April 28 and a total of three fish were sampled on April 29 and 30. These numbers would suggest that summer steelhead were just beginning to reach Westland. The number of fish captured continued to increase until the middle of May and then began to drop off until the trap was closed on May 23. Very few fish were captured after the trap was reopened on June 1, and only five fish were sampled from June 8 to June 30, the last day a hatchery steelhead was sampled. The number of fish trapped on May 22 however, suggests that substantial numbers of fish migrated passed the facility after the trap was closed on May 23.

Without sacrificing a sample of the coded-wire tagged fish for tag identification, it was impossible to differentiate between the acclimated fish and the fish released directly instream. The data does suggest however, that the acclimated groups released on March 29, did not migrate downriver until late April or May.

The data also suggests that the peak outmigration period for all groups was the first two to three weeks in May. The two non-acclimated groups were released at 5.0 and 5.5/lb., while the acclimated fish were released at 5.8/lb. The smaller size of the acclimated fish may have resulted in a delay in their outmigration. An estimated 48.6% of the 199,404 summer steelhead smolts released in the upper Umatilla River were trapped and hauled.

Naturally produced steelhead smolts were also monitored at Westland and the first fish sampled was on March 25 (Appendix J). Relatively small numbers of fish were captured until April 13, when an estimated 1,170 unmarked steelhead were trapped (Table 17). The trap was closed on April 14 and remained closed until April 27. When the trap was reopened, numerous fish were captured. The numbers peaked around May 6, and then began to decline, although many fish were still being captured when the trap was closed on May 23. Only one unmarked steelhead was observed after the trap was reopened on June 1.

The peak migration period may have been a little earlier for naturally produced steelhead. The data suggests that numerous fish migrated passed Westland when the trap was closed in April. If this assumption is correct, the peak migration period appeared to be from the middle of April to the middle of May.

Length data indicates that the hatchery fish were larger than the wild fish (Figure 9). The average lengths of the coded-wire tagged and adipose clipped only fish were 217 and 218mm, respectively, while the average length of the wild fish was 195mm. The hatchery fish were all yearlings at release while the predominant freshwater age for the wild fish is two years (Cramer 1992).

Spring Chinook Yearlings

Spring chinook yearlings were released at Umatilla RM 89 and Bonifer on April 14 and April 21, respectively. The Westland trap was closed during this period, but when it was reopened on April 27, significant numbers of spring chinook yearlings were captured (Table 17). This would suggest that large numbers of fish probably bypassed the facility before this date. In early May, the number of fish trapped dropped off significantly. Only nine fish were sampled from May 6 to May 18, the last day a spring chinook yearling was observed (Appendix J).

This data suggests that most of the fish migrated quickly downriver and that the peak migration period occurred within a week or two after release. An estimated 4.6% of the 299,011 spring chinook yearlings released in the upper Umatilla River were trapped and hauled.

Spring Chinook Subyearlings

Juvenile spring chinook subyearlings released at Umatilla RM 80 beginning on May 11, were captured at Westland on May 13 (Table 17). Large numbers of fish were captured until the trap was closed on May 23. When the trap was reopened on June 1, juveniles were still being captured, but in significantly reduced numbers. An estimated 21 fish were sampled from June 11 to June 19, the last day a spring chinook subyearling was observed (Appendix J).

The data suggests that subyearling spring chinook also migrated rapidly downriver. Some fish reached Westland (approximately 53 rivermiles downriver from the release point) in less than two days and the peak migration period appeared to occur within a week after release. An estimated 43.2% of the 1,250,210 spring chinook subyearlings released in the Umatilla River were trapped and hauled.

Fall Chinook Subyearlings

Fall chinook subyearlings were released at Umatilla RM 42 between May 18 and May 21. Large numbers of fish began showing at Westland (15 rivermiles downriver) on May 19, but the trap was closed to allow the fish to imprint. On May 20 however, the trap was opened because of the rapid accumulation of fish at the facility. Thousands of juveniles were captured until the trap was closed on May 23 (Table 17). When the trap was reopened on June 1, large numbers of fish were still being trapped, but the numbers were greatly

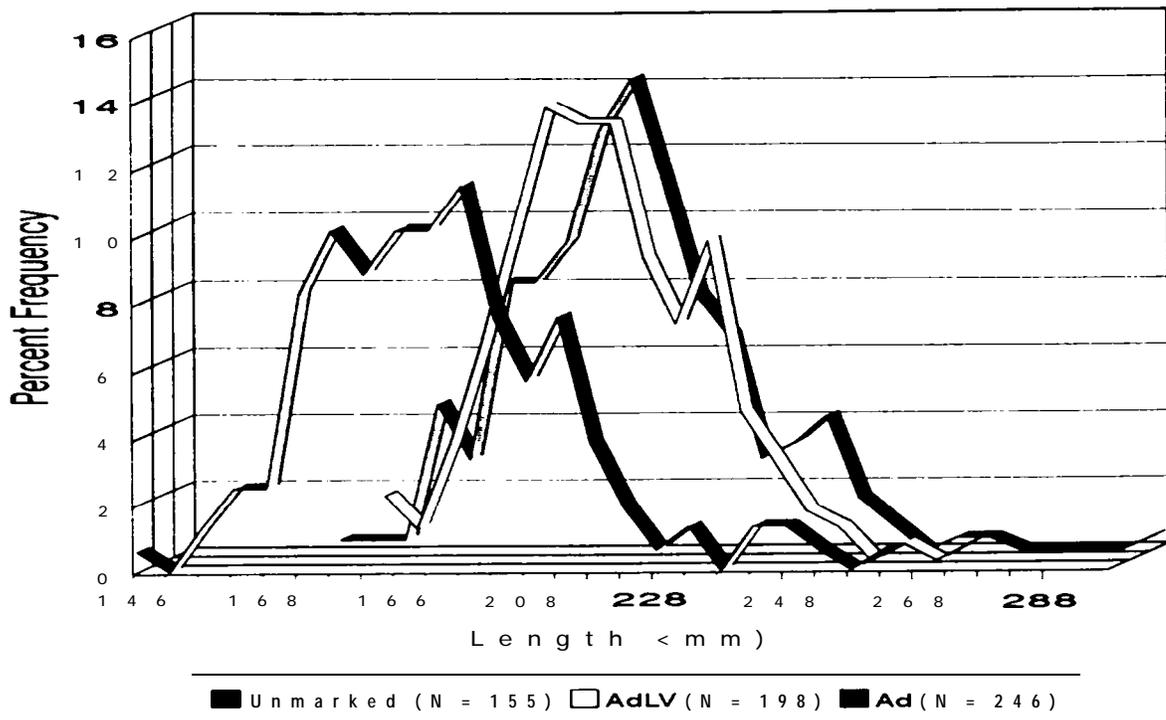


Figure 9. Length frequencies of summer steelhead sampled at Westland in 1992.

reduced and continued to steadily decline. When the trap was closed for the season on July 27, a few fish were still being captured, but the numbers were extremely low and they were bypassed instead of trapped.

The fall chinook subyearlings migrated rapidly downriver as well and the peak migration period past Westland appeared to be within a week after release. An estimated 54.4% of the 3,182,712 fall chinook subyearlings released in the Umatilla River were trapped and hauled.

Natural Production

Naturally produced spring chinook yearlings were observed at Westland in 1992 for the first time (Table 17). The first fish were sampled on March 25, the first day the trap was in operation, but some fish may have migrated past the facility prior to this date. The trap was closed from April 14 to April 26, but a relatively large number of fish captured on April 13 suggests that significant numbers of fish may have migrated past the facility during the closure period. When the trap was reopened on April 27, the number of fish captured was lower, but appeared to peak again around the middle of May.

The estimated number of naturally produced yearling coho trapped was relatively low (Table 17). The first fish was sampled on June 4, and only 18 fish were sampled until the close of the trap on July 27 (Appendix J). This was the first year however, that naturally produced coho yearlings have been observed at Westland. The number of subyearling coho trapped was also small (Table 17). The number of subyearlings sampled seemed to increase during freshet periods with high turbidity. It is possible the subyearlings were moving downriver simply to avoid the muddy conditions in the river.

Acclimation Research

Collection of snouts from coded-wire tagged fish

Snouts from four jack and two adult fall chinook salmon were collected at Three Mile Dam in 1992 and snouts from another six jacks and 15 adults were collected from broodstock held at Minthorn. Additional snouts from eight adults were collected from spawning ground surveys below Three Mile Dam conducted through funds provided by Bureau of Indian Affairs. Size categories were defined as 381 to 609mm for jacks and > 609mm for adults. The arbitrary cutoff for jack size was determined by CTUIR biologists who examined age and length data from coded-wire tag recoveries (CTUIR data files).

Snouts from three spring chinook jacks and 184 adults were collected at Three Mile Dam and snouts from an additional 38 spring chinook adults were collected on spawning ground surveys conducted above Three Mile Dam. The snouts from 65 summer steelhead, 12 coho adults and six coho jacks were also collected at Three Mile Dam. Snouts from 40 steelhead broodstock were also collected. All snouts were delivered to ODFW in Clackamas, OR. for code identification.

Adult Survival and Umatilla River Returns

Summer Steelhead

Since 1975, all Umatilla River summer steelhead releases have been from Umatilla River broodstock. The first coded-wire tagged releases were in April of 1988 (Table 18). An acclimated group was released from Minthorn while a control group was released into the Umatilla River near Minthorn.

The estimated recovery of adults from the acclimated release was higher than from the control release (0.61 versus 0.45%, respectively) despite the larger size of the non-acclimated group at release (Table 18). Carmichael et al. (1988) have shown that survival of steelhead released in the Snake River basin may be higher for fish released at a larger size. Returns of acclimated and control fish to the Umatilla River however, were similar (0.37 and 0.33%, respectively).

Table 10. Liberation and survival information for summer steelhead released in the Umatilla River.

Brood	Number Released	Dated Release	Size at Release	Number Tagged	CWT Code	Release Location	Estimated Adult Survival					
							%	Total	Canada Ocean	Oregon		Fish Trap
										Col.R. Net	F w Sport	
87	10107	Apr 88	7.4	9029	073859	Minthorn	0.47	46	0	12	0	36
07	10075	Apr 88	7.4	9721	073860	Minthorn	0.73	74	0	36	0	38
07	10287	Apr 88	7.4	9925	073061	Minthorn	0.63	65	0	23	3/1	39
Total	30549			29475			0.61	107	0	71	3	113
87	10423	Apr 88	6.5	9609	073056	Nr. Minthorn	0.67	70	2	14	1212	42
07	10171	Apr 88	6.5	9455	073057	Nr. Minthorn	0.40	41	0	8	0	33
07	10163	Apr 88	6.5	9448	073858	Nr. Minthorn	0.28	28	0	0	3/1	25
Total	30757			28592			0.45	139	2	22	15	100
00	9949	May 09	6.6	0704	074720	Minthorn	0.04	4	0	0	3/1	1
00	9954	May 09	6.6	0709	074723	Minthorn	0.01	1	0	0	0	1
00	9949	May 09	6.6	8784	074724	Minthorn	0.03	3	0	0	0	3
Total	29052			26357			0.03	8	0	0	3	5
00	9073	May 09	5.6	0000	074715	Nr. Minthorn	0.07	7	0	0	0	7
88	9064	May 09	5.6	0791	074717	Nr. Minthorn	0.07	7	0	0	0	0
00	9849	May 09	5.6	8778	074710	Nr. Minthorn	0.01	1	0	0	0	11
Total	29506			26369			0.05	15	0	0	0	15
09	10239	May 90	5.9	9331	075212	Bonifer	0.49	50	0	11	10	29
09	10022	May 90	5.9	9133	075213	Bonifer	0.43	43	0	7	2/1	34
09	9964	May 90	5.9	9080	075214	Bonifer	0.64	64	0	35	7/1	22
Total	30225			27544			0.52	157	0	53	19	85
09	9630	May 90	5.5	9511	075215	Nr. Bonifer	0.50	55	0	18	7/1	30
09	9045	May 90	5.5	9525	075216	Nr. Bonifer	0.51	50	0	16	4/1	30
09	9771	May 90	5.5	9454	075217	Nr. Bonifer	0.61	60	0	13	26/3	21
Total	29446			20490			0.56	165	0	47	37	01
90	10086	May 91	6.2	9635	075340	Bonifer	0.15	15	0	0	7	0
90	10070	May 91	6.2	9019	075341	Bonifer	0.06	6	0	2	4	0
90	10065	May 91	6.2	9814	075342	Bonifer	0.11	11	0	4	7	0
Total	30221			29460			0.11	x?	0	14	10	0
90	9754	May 91	0.7	9432	075343	Nr. Bonifer	0.14	14	0	10	4	0
90	9790	May 91	0.7	9467	075344	Nr. Bonifer	0.04	4	0	3	1	0
90	9781	May 91	0.7	9458	075345	Nr. Bonifer	0.12	12	0	12	0	0
Total	29325			20357			0.10	30	0	25	5	0

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- /1 Caught at mouth d Deschutes River
- /2 Three caught at mouth d Deschutes River.
- /3 One caught at mouth d Deschutes River.

An estimated 65.3% of the adults recovered from both releases were captured at Three Mile Dam on the Umatilla River and 28.5% were recovered in the Columbia River gillnet fishery. An estimated 5.5% were caught in the Columbia River sport fishery.

A second group of acclimated fish was released from Minthorn in May of 1989 and a control group was released instream near Minthorn at the same time as the acclimated release (Table 18). Although no apparent problems were encountered with these releases, (Lofy et al. 1990), recoveries have been poor. Estimated adult recoveries from the acclimated and control groups are 0.03 and 0.05%, respectively.

Summer steelhead releases in 1990 were also made in May (Table 18). An acclimated group was released from Bonifer and a control group was released into Meacham Creek concurrent with the acclimated group. Preliminary recoveries from the acclimated group (0.52%) are similar to the control group (0.56%), even though the control group was slightly larger at release (Table 18). Umatilla River recoveries from the acclimated and control groups were both 0.28%. An estimated 51.6% of the recoveries from both releases have been from the Umatilla River, while an estimated 31.1 and 17.4% of the recoveries have been from the Columbia River gillnet and Columbia River sport fisheries, respectively.

A fourth acclimation study was conducted at Bonifer in May of 1991. Preliminary recoveries from the Columbia River net and sport fisheries are similar for both the acclimated and control groups (0.11 and 0.10%, respectively), although the fish from the control group were significantly smaller at release. Umatilla River recoveries are not yet available.

Fall Chinook - Tule Stock

Initial releases in 1982 of fall chinook salmon in the Umatilla River were subyearling Tule stock (Table 19). The fish with tag codes 050851 and 051057 were tagged by the National Marine Fisheries Service and were reared at Spring Creek National Fish Hatchery (NFH). The fish with tag code 072663 were tagged by ODFW and were reared at Bonneville State Fish Hatchery (SFH). All the fish were from eggs collected at Spring Creek NFH. They were released at 79.0 and 92.0/lb., respectively, in April, 1982, at RM 1.5 and 5 1.5 (Table 19).

Survival rates ranged from 0.46 to 0.56% (Table 19). These rates are at the lower end of the range experienced by Spring Creek NFH (0-2.1%), but higher than many other releases of Tule stock from Spring Creek NFH released at other locations. Most fish were recovered as age-3 fish, similar to reports for fish from the 1978 and 1979 brood years released elsewhere (Howell et al. 1985).

Exploitation (commercial, sport and treaty catches) of Tule stock was 99.0% for all releases. Ocean commercial and Columbia River gillnet catches were 46.4 and 37.8%, respectively. Sport and treaty exploitation rates were 12.4 and 2.4%, respectively.

Table 19. Liberation and survival information for Tule stock fall chinook salmon released in the Umatilla River.

Br Yr. Stock	Number Released	Date of Release	Size at Release	Number Tagged	CWT	Code	Release Location	Estimated Adult Survivals				
								%	Total	Ocean	Col.R	Uma.R.
61 T	306279	Apr 82	79.0	46707	a50651		Umatilla R. /1	0.47	1429	767	662	0
81 T	672057	Apr 82	79.0	102331	061067		Umatilla R. /1	0.56	3730	2154	1576	0
Total	978336			149038				0.53	5159	2921	2236	0
81 T	2626635	Apr 82	92.0	162366	072663		Umatilla R. (RM 1.5)	0.46	13013	7570	5443	0

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/1 Approximately 46.7% of the fish were released at RM 1.5 and 51.3% at RM 51.5.

Fall Chinook - Bonneville Stock

All releases since 1982 have been of Bonneville and Priest Rapids upriver bright stock. The first liberations of fish from Bonneville stock were from adult returns to Bonneville SFH with some fish taken from Bonneville Dam. All yearling fish have been released in the upper river from RM 56 up to RM 87 on the Umatilla River and up to RM 30 of Meacham Creek (28 RM above Bonifer and 109 RM from the mouth of the Umatilla River) (Table 20). Three releases were made in April, while all others were made in March. The yearling fish ranged from 4.8 to 10.2/lb. at release from 1983 to 1992.

Prior to 1990, all but one release of subyearling fish was near the mouth of the river because of potential for fish loss due to unscreened or partially screened irrigation diversions (Table 21). One group of fish was released in October, 1985, after being reared at Bonifer over the summer. Beginning in 1990, all subyearling releases have been in the upper river. One group of fish was acclimated at Minthorn in October of 1990 and released, while a control group was released into the Umatilla River at the same time as the acclimated group. All other releases have been in the spring. Subyearling fish released in the spring have ranged from 73.0 to 92.3/lb., while fish released in the fall have ranged from 8.8 to 16.2/lb.

For discussion of survival, releases are grouped by age at release, time of release (spring versus fall releases), and release location (lower Umatilla River and upper Umatilla River and tributaries). Releases in the upper river include those made at the Minthorn and Bonifer Acclimation Facilities.

The estimated survival rates (through age-7 fish) from yearling releases made from 1983 to 1986 (1981 to 1984 brood years) have ranged from 0.08 to 3.01% (Table 20). Releases made in 1983 and 1984 survived poorly (0.16 and 0.08%, respectively). Survival increased to 0.76% for 1985 releases and 3.01% for 1986 releases. Survival (through age-7 fish; preliminary data) of the 1987 releases from acclimation facilities is 2.19%. Through

Table 20. Liberation and survival information for Bonneville stock yearling fall chinook salmon released in the Umatilla River. /1

Br. Yr Stock	Number Released	Date of Release	Size at Release	Number Tagged	CWF Code	Release Location	Estimated Adult Survivals /2				
							%	Total	Ocean	Col.R. Uma.R.	
61 B	100564	Apr 63	5.9	99570	072741	Bonifer & Meacham cr.	0.16 /3	160	67	73	0
82 B	226412	Apr 84	8.6	96448	072829	Bonifer & Meacham Cr.	0.00	136 /4	96	40	0
83 B	198162	Mar 85	7.8	88306	073127	Uma.R. (RM 87) & Bonifer	0.7613	1504	853	649	2
84 B	206815	Mar 85	4.6	66330	073327	Bonifer & Minthorn	3.01 /3	2737 /5	1530	1146	61
85 B	22216	Mar 87	8.1	10103	073823	Minthorn	2.13 /3	473	237	165	51
85 B	22523	Mar 87	8.1	10243	073824	Minthorn	1.9713	44.4	204	211	29
85 B	21607	Mar 67	a.1	9917	073625	Minthorn	2.10 /3	456	220	1 %	53
85 B	20881	Mar 67	a.1	94 %	073626	Minthorn	2.39 /3	4 %	259	209	31
65 B	21716	Mar 67	6.1	9876	073627	Minthorn	1.65 /3	359	194	128	37
Total	109143			49635			2.05	2233	1114	910	201
85 B	207 %	Mar 67	6.6	10253	073626	Bonifer	2.31	480	229	237	14
85 B	20212	Mar 67	6.6	9970	073629	Bonifer	2.26	456	233	209	14
85 B	20546	Mar 67	6.6	10135	073830	Bonifer	2.68 /3	551	229	298	24
85 B	20381	Mar 87	8.6	10053	073831	Bonifer	2.13	434	203	195	36
85 B	20438	Mar 87	8.6	10081	073832	Bonifer	2.35 /3	480	227	229	24
Total	102363			50492			2.35	2401	1121	1166	112
86 B	52317	Mar 88	8.8	42068	074038	Minthorn	2.61 /3	1363	746	474	143
86 B	48474	Mar 88	8.8	38978	074039	Minthorn	2.45 /3	1188	662	395	131
Total	100791			61046			2.53	2551	14 %	869	274
86 B	50480	Apr 88	10.2	39509	074036	Bonifer	1.96 /3	991	574	316	101
86 B	49070	Apr 88	10.2	38405	074037	Bonifer	2.14 /3	1047	558	383	106
Total	99550			77914			2.05	2038	1132	699	207
90 B	122639	Mar 92	7.7	26160	075619	Uma RM 56	0.00	0	0	0	0
90 B	97801	Mar 92	7.6	26178	075618	Uma RM 70	0.00	0	0	0	0
Total	220440			52338			0	0	0	0	0

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/1 Adult returns from the 1986 and 1990 broods are incomplete.

/2 The data reported in the table are expanded numbers.

/3 Sub-jack recoveries were not used in estimating expanded survival numbers.

/4 The expanded survival data is based on a release of 175,104 fish in Meacham Cr. (RM 30). It does not include 53.3% fish released at Bonifer (RM 2 of Meacham Cr.)

/5 The expanded survival data is based on a release of 91,036 fish at Minthorn. It does not include 115,779 fish released at Bonifer.

Table 21. Liberation and survival information for Bonneville stock subyearling fall chinook salmon released in the Umatilla River. /1

Br. Yr. stock	Number Released	Date of Release	Size at Release	Number Tagged	CWT	Code	Release Location	Estimated Adult Survivals /2						
								%	Total	Ocean	Col.R.	Uma.R.		
83 B	996250	Jun 84	65.1	210441	073124		Uma.R. (RM 1.5) a Col.R.	0.76	/3	51%	/4	1626	3560	0
84 B	5223172	Jun 85	92.3	206756	073326		Umatilla R. (RM 1.5)	0.87	27967	10990		16930	47	
84 B	51000	Oct 85	1 6.2	30638	073162		Bonifer	0.67	340	147	1 %		3	
85 B	197432	Jun 86	86.0	20636	073633		Umatilla R. (RM 1.5)	0.65	1202	526		756	0	
85 B	198153	Jun 86	86.0	21335	073634		Umatilla R. (RM 1.5)	0.36	7 %			353	353	0
85 B	197466	Jun 86	86.0	20690	073635		Umatilla R. (RM 1.5)	0.37	7 %			363	372	0
85 B	196952	Jun 86	86.0	20170	073636		Umatilla R. (RM 1.5)	0.49	967	254		713	0	
6 5 8	19777 %	Jun 86	86.0	20982	073637		Umatilla R. (RM 1.5)	0.47	934	255		679	0	
85 B	206105	Jun 86	86.0	26615	073636		Umatilla R. (RM 1.5)	0.36	790	330		460	0	
85 B	208958	Jun 86	86.0	21659	073639		Umatilla R. (RM 1.5)	0.54	1129	2 %		a49	0	
8 6 3	2075.50	Jun 86	86.0	20269	073840		Umatilla R. (RM 1.5)	0.57	1166	625		563	0	
85 B	208184	Jun 88	86.0	20895	073841		Umatilla R. (RM 1.5)	0.49	1016	149		867	0	
85 B	208924	Jun 86	86.0	21694	073842		Umatilla R. (RM 1.5)	0.46	954	289		665	0	
Total	2029602			209145				0.48	9701	3424		6277	0	
89 B	808560	May - Jun 90	87.5	52965	075403		Umatilla R. (RM 70-79)	0.03	229	0		137	92	
89 B	606560	May - Jun 90	87.6	52965	075404		Umatilla R. (RM 70-79)	0.04	351	76		229	46	
89 B	808561	May - Jun 90	87.5	52965	0754 %		Umatilla R. (RM 70-79)	0.03	229	15		107	107	
Total	2425681			158895				0.03	809	91		473	245	
8 8 3	25311	Oct 90	9.2	233 %	075325		Minthorn	0.02	4	4		0	0	
89 B	23724	Oct 90	9.2	21929	075326		Minthorn	0.01	3	2		0	1	
09 B	22828	Oct 90	9.2	21101	075927		Minthorn	0.02	5	0		4	1	
Total	71669			66426				0.02	12	6		4	2	
89 B	25472	Oct 90	8.8	25413	075322		Nr. Minthorn	0.01	2	0		2	0	
89 B	25694	Oct 90	8.0	23617	075923		Nr. Minthorn	0.00	1	0		1	0	
09 B	25480	Oct 90	8.6	23420	075924		Nr. Minthorn	0.01	2	0		2	0	
Total	76646			70450				0.01	5	0		5	0	
90 B	53864	May 91	82.0	52252	075225		Umatilla R. (RM 70)	0.00	1	0		1	0	
9 0 0	53595	May 91	82.0	51728	075226		Umatilla R. (RM 70)	0.00	0	0		0	0	
9 0 B	50442	May 91	73.0	48266	075326		Umatilla R. (RM 70)	0.00	2	0		0	2	
90 B	50101	May 91	73.0	48481	076448		Umatilla R. (RM 70)	0.01	7	0		5	2	
90 B	49732	May 91	73.0	48301	070016		Umatilla R. (RM 70)	0.00	1	0		1	0	
90 B	52926	May 91	82.0	51614	075450		Umatilla R. (RM 70)	0.00	1	0		0	1	
	52706	May 91	82.0	52444	075451		Umatilla A (RM 70)	0.01	4	0		3	1	
Total	362766			353286				0.00	16	0		10	6	
90 B	26461	May 91	80.5	26173	076663		Minthorn	0.00	0	0		0	0	
9 0 B	26565	May 91	60.5	24762	075601		Minthorn	0.00	0	0		0	0	
90 B	26606	May 91	80.5	25476	075602		Minthorn	0.00	1	0		0	1	
Total	79672			76411				0.00	1	0		0	1	
90 B	25862	May 91	86.0	25720	075560		Nr. Minthorn	0.03	7	0		7	0	
90 B	257 %	May 91	86.0	25425	075561		Nr. Minthorn	0.00	0	0		0	0	
90 B	23295	May 91	86.0	22309	075562		Nr. Minthorn	0.00	1	0		1	0	
Total	74865			79454				0.01	8	0		8	0	

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/1 Adult returns from the 1986-90 brood years are incomplete.

/2 The data reported in the table are expanded numbers.

/3 Sub-jack recoveries were not used in estimating expanded survival numbers.

/4 The expanded survival data is based on a release of 667,190 fish in the Umatilla River (RM 1.5). It does not include 329,060 fish released at Rock Cr Slate Park in the Columbia Ri.

age-6 fish, the survival rate (preliminary data) is 2.29% for all groups released in 1988 from acclimation facilities. In comparison, the survival of the 1986 releases through age-6 fish was 3.01%.

All releases in the lower river have been made with subyearling fish (Table 21). Fish were released near the mouth (RM 1.5), below all major diversions, and releases were made later in the season (June) than yearling releases (March and April) to get the fish to a larger size at release (85.1 to 92.3/lb).

Survival of the 1984 and 1985 June releases (through age-7 fish) was 0.78 and 0.87%, respectively (Table 21). Preliminary recoveries (through age-7 fish) from the 1986 releases vary from 0.36 to 0.65% with an average of 0.48%. This is lower than the survival of the fish from the same brood released the following spring after being acclimated (2.19%).

Survival of the subyearling fish released in October of 1985 was 0.67% (Table 21). This is lower than the survival from the same brood released near the mouth in June (0.87%), and much lower than the survival of the fish held longer at the hatchery and released the following March (3.01%).

The first spring releases of subyearlings in the upper river were made in 1990 (Table 21). Estimated preliminary survival (through age-3 fish) is 0.03%. An estimated 69.7% of the recoveries were made in the ocean and Columbia River fisheries, and an estimated 30.3% were recovered in the Umatilla River. This compares to less than 0.01% (through age-7 fish) of all recoveries being made in the Umatilla River from 1984 through 1986 spring releases.

Data from early releases (1986 brood and earlier) of yearling and subyearling fish show that most of these fish were recovered as age-4 fish, similar to results from this stock released elsewhere (Howell et al. 1985). Very few age-7 adults have been recovered (Appendix D).

Exploitation of the Bonneville stock of upriver bright fish (through 1986 brood) was 88.8%. Although the overall average exploitation rate was similar for releases of yearlings (91.2%) as for releases of subyearlings (88.1%), distribution of the catch differed. Adults from subyearling releases were recovered more frequently in the Columbia River gillnet fishery (48.8%) than in the ocean commercial fishery (36.3%), whereas adults from yearling releases were recovered more often in the ocean commercial catch (45.0%) than in the Columbia River gillnet fishery (33.9%). Sport catch averaged 2.8% of the recoveries of adults from subyearling releases and 10.4% of adults from yearling releases. Likewise, 0.2% of the recoveries of adults from subyearling releases were from the treaty fisheries, while 2.0% were from adults from the yearling releases.

Fall Chinook - Priest Rapids Stock

Beginning with releases in 1987, upriver bright stock of upriver origin was available for release in the Umatilla River (Table 22). These juveniles were from adults returning to Priest Rapids Dam (1986 brood).

Preliminary recovery data (through age-6 fish) shows that estimated adult recovery rates (0.71 to 0.85) from subyearling releases made in May of 1987 near the mouth of the Umatilla River, are similar to adult recovery rates (at the same age) from Bonneville stock released in 1984 and 1985 (0.78 and 0.87%, respectively) but higher than the recovery rates for 1986 releases (0.36 to 0.65%). The Priest Rapids stock however, were released at a larger size (60.4/lb. versus 85.1 to 92.3/lb. for the Bonneville stock) and they were released in May instead of June.

A second group of subyearling fish was acclimated at Minthorn and released in July (Table 22). However, due to low dissolved oxygen levels and pump failure (Lofy et al. 1988), very few fish were released and the total recovery is estimated to be five adults.

In 1988, one group of subyearlings (1987 brood) was released in May at Umatilla RM 23. Preliminary survival through age-5 fish is 0.07%. This compares to 0.79% at the same age for the 1987 May release. The size at release for both groups was similar.

Two groups of fish (1987 brood) were released in November of 1988 (Table 22). One group was acclimated at Minthorn and released while a control group was released near Minthorn at the same time as the acclimated group. The acclimated group suffered severe losses due to "Ich" and a relatively small number of fish were released (Lofy 1989). Through age-5 fish, the survival of the acclimated and control groups are 0.47 and 0.46%, respectively.

In May of 1989, a group of subyearlings was released at Umatilla RM 23. They were released at 66.6/lb., similar to releases made in 1987 and 1988. The recovery rate (through age-4 fish; preliminary data) is 0.06%. The recovery rates of the 1987 and 1988 May releases (at the same age) were 0.71 and 0.07%, respectively. In comparison, recovery rates (through age-4 fish) from Bonneville stock subyearling releases in 1984, 1985, and 1986, were 0.69, 0.60, and 0.35%, respectively. As mentioned, the Priest Rapids stock was released in May at 66.6/lb., while the Bonneville stock was released in June at 85.1 to 92.3/lb.

A second acclimation experiment was conducted in October of 1989. One group of fish was acclimated at Minthorn prior to release, and a control group was released instream concurrent with the acclimated group (Table 22). Preliminary survival rates of the two groups (through age-4 fish) are 0.06 and 0.04%, respectively.

Table 22 Liberation and survival information for Priest Rapids stock fall chinook salmon released in the Umatilla Ri. /1

Br. Yr Stock	Number Released	Date Of Release	Size at Release	Number Tagged		CWF Code	Release Location	Estimated Adult Survivals /2				
								%	Total	Ocean	Col.R.	Uma.R.
86 P	497572	May 87	60.4	40793	073912		Umatilla R.(RM 1.5)	0.71	3549	1512	1964	73
86 P	501266	May 07	60.4	41096	073913		Umatilla R.(RM 1.5)	0.81	4037	1927	2061	49
86 P	<u>477992</u>	May 87	60.4	<u>39187</u>	073914		Umatilla R.(RM 1.5)	<u>0.85</u>	<u>4050</u>	<u>2086</u>	<u>1842</u>	<u>122</u>
Total	1476830			121076				0.79	11636	5525	5867	244
86 P	670	Jul 87	20.0	643	073915		Minthorn	0.00	0	0	0	0
86 P	672	Jul 87	20.0	645	073916		Minthorn	0.00	0	0	0	0
86 P	<u>658</u>	Jul 87	20.0	<u>632</u>	074036		Minthorn	<u>0.79</u>	<u>5</u>	<u>0</u>	<u>5</u>	<u>0</u>
Total	2000			1920				0.25	5	0	5	0
87 P	1986757	May 66	68.3	198285	075007		Umatilla R.(RM 23)	0.07	1295	657	495	143
87 P	4023	Nov 88	9.8	4438	074539		Minthorn	0.47	23	13	9	1
87 P	4660	Nov 88	9.8	4289	074640		Minthorn	0.23	10	4	5	1
87 P	<u>4925</u>	Nov 88	9.8	<u>4533</u>	074541		Minthorn	<u>0.68</u>	<u>34</u>	<u>23</u>	<u>11</u>	<u>0</u>
Total	14408			13260				0.47	67	40	25	2
87 P	26858	Nov 88	8.6	24656	074536		Nr. Minthorn	0.37	98	33	52	13
a7 P	25493	Nov 88	8.6	23403	074537		Nr. Minthorn	0.55	140	83	41	16
87 P	<u>27330</u>	Nov 88	8.6	<u>25089</u>	074538		Nr. Minthorn	<u>0.47</u>	<u>130</u>	<u>62</u>	<u>48</u>	<u>20</u>
Total	79681			73148				0.46	368	178	141	49
88 P	797904	May 89	66.6	52228	074646		Umatilla R.(RM 23)	0.07	550	15	443	92
88 P	797903	May 99	66.6	4977	1 074647		Umatilla R.(RM 23)	0.06	513	128	321	64
88 P	<u>797904</u>	May 89	66.6	<u>52244</u>	074648		Umatilla R.(RM 23)	<u>0.05</u>	<u>428</u>	<u>46</u>	<u>382</u>	<u>0</u>
Total	23937 11			154243				0.06	1491	189	1146	156
88 P	26770	Oct 89	10.9	26.358	074753		Minthorn	0.07	18	7	10	1
88 P	26617	Oct 89	10.9	25028	074754		Minthorn	0.06	15	2	9	4
88 P	<u>25438</u>	Oct 89	10.9	<u>25438</u>	074757		Minthorn	<u>0.06</u>	<u>15</u>	<u>4</u>	<u>7</u>	<u>4</u>
Total	78825			76824				0.06	48	13	26	9
88 P	27071	Oct 89	11.1	26790	074758		Nr. Minthorn	0.04	11	0	10	1
88 P	25420	Oct 89	11.1	24285	074760		Nr. Minthorn	0.04	10	2	8	0
88 P	<u>25633</u>	Oct 89	11.1	<u>25350</u>	074763		Nr. Minthorn	<u>0.04</u>	<u>10</u>	<u>1</u>	<u>5</u>	<u>4</u>
Tot3	78132			76425				0.04	31	3	23	5

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/1 Adult returns are Incomplete.

/2 The data reported in the table are expanded numbers.

The estimated exploitation rate (through 1989 releases; preliminary data) on subyearling Priest Rapids stock is 83.4%, similar to the exploitation rate on subyearling Bonneville stock (88.1%). The ocean commercial and Columbia River gillnet exploitation rates are similar (40.5 and 37.0%, respectively). The sport and treaty exploitation rates are 5.0 and 0.8%, respectively.

Fall Chinook - Straying

Juvenile fall chinook releases from the Umatilla River have caused concern because of returning adults straying to Columbia and Snake River facilities and spawning grounds located above McNary Dam. When comparing estimated adult recoveries from the Umatilla River with recoveries above McNary Dam, the data suggests that the releases of subyearling chinook have resulted in higher stray rates than the releases of yearling fish. Based on coded-wire tag recoveries, no known adults from the release of Tule stock in 1982 were recovered in the Umatilla River, while an estimated 111 adults were recovered at Washington Hatcheries (Table 23)¹. The stray rate from releases of subyearling Bonneville stock has generally been higher than the stray rate from releases of subyearling Priest Rapids stock. The stray rate of Bonneville stock subyearlings released in 1984, 1985, 1986 and 1990 has averaged 94.8% (preliminary data), while the stray rate of Priest Rapids stock subyearlings released in 1987, 1988 and 1989 has averaged 75.6%. The Priest Rapids stock however, was generally released earlier in the year than the Bonneville stock and at a larger size. The stray rates of Bonneville and Priest Rapids stock subyearlings released in the fall have averaged 80.8 and 54.5%, respectively, but the total number of recoveries has been minimal. The stray rate of yearling releases (Bonneville stock) from 1983 through 1988 has averaged 31.5% (preliminary data).

The strays from subyearling releases of Bonneville stock have been recovered most often on spawning ground surveys conducted at Ringold. Adult strays from releases of all other subyearling groups have been recovered most frequently at Lyons Ferry and Priest Rapids Hatcheries. An estimated 78.8% of all strays from yearling releases have also been recovered at Lyons Ferry and Priest Rapids Hatcheries.

The high stray rate is believed to be the result of low flows at the mouth of the Umatilla River during the adult return season and in the case of subyearling releases, lack of imprinting because all early releases of subyearlings (1982 through 1989) have been in the lower river and in the Columbia River itself (1984 releases). Beginning in 1990, all releases of fall chinook juveniles have been in the upper river (RM 56 to 89) and all future releases are proposed for the upper river. Proposed acclimation facilities will also be used to acclimate juvenile fall chinook salmon prior to release. The Umatilla Basin Project will help to provide better attraction and fish passage flows in the Umatilla River. Plans call for an exchange of Columbia River water for water which is currently being taken directly from the Umatilla River for irrigation. Columbia River water will be pumped into the irrigation delivery systems, leaving Umatilla River water in the river.

¹ Fourteen adipose clipped adults were recovered in the Umatilla River in 1987, but the tags were never read.

Table 23. Liberation, survival, and straying information for fall chinook salmon released in the Umatilla River.

Brood Year	Numbs Released	Date of Release	Size a Release	Release Location	Estimated Adult Survival										Spawn			
					Umatilla River		Washington /1		Washington Hatcheries				/2		Fish Traps			
					No.	%	No.	%	Lyons Ferry No.	Lyons Ferry %	Priest Rapids No.	Priest Rapids %	Wells Dam No.	Wells Dam %	No.	%	No.	%
<u>Subyearling spring releases (Tule stock)</u>																		
81	978336	Apr 82	790	Umatilla R /3	0	0.0	0	0.0										
81	<u>2828836</u> 3807171	Apr 82	920	Umatilla R (RM 15)	0	0.0	111	100.0	83	74.8	28	25.2						
					0	0.0	111	100.0	83	74.0	28	25.2						
<u>Subyearling spring releases (Bonneville stock)</u>																		
83	667190	June 84	851	Uma R (RM 15) & Col R	0	0.0	1138	100.0	97	8.1	38	3.3			1005	88.3	3	0.3
84	3223172	June 85	923	Umatilla R (RM 15)	47	7.0	2260	98.0	125	5.5	62	2.7			2073	91.7		
85	2029602	June 86	86.0	Umatilla R (RM 15)	0	0.0	1679	100.0	417	24.6	126	7.5			1135	74	67.6	
89	<u>2425681</u> 8345645	May-Jun 90	67.5	Umatilla R (RM 70 & 79)	245	51.7	229	40.3	153	66.8					76	33.2		
					292	5.2	5306	94.8	787	14.8	228	4.3			4289	80.8	3	0.1
<u>Subyearling spring releases (Priest Rapids stock)</u>																		
86	1476830	May 87	604	Umatilla R (RM 15)	244	20.2	964	79.8	586	60.8	305	31.6	12	1.2	61	7.5	6.3	
86	2000	July 87	20.0	Minthorn	0	0.0	1	100.0	1	100.0								
87	1666757	May 88	68.3	Umatilla R (RM 23)	143	46.9	162	53.1	76	46.9	76	46.9			10	6.2		
88	<u>2383711</u> 5759298	May 89	666	Umatilla R (RM 23)	156	21.6	559	78.2	310	55.5	93	16.6	47	8.4	78	14.0	16	2.9
					543	24.4	1686	75.6	973	57.7	474	28.1	59	3.5	149	8.8	16	0.9
<u>Subyearling fall releases (Bonneville stock)</u>																		
84	51000	Oct 85	162	Bonifer	3	1.50	17	85.0	17	100.0								
89	71863	Oct 90	8.2	Minthorn	2	66.7	1	33.3		0.0					1	100.0		
89	<u>78646</u> 199509	Oct 90	8.8	Nr Minthorn	0	0.0	3	100.0	1	33.3			2	2	66.7			
					5	19.2	21	80.8	18	65.7			2	2	9.5	1	4.8	

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Table 23. (Cont.)

Brood Year	Number Released	Date of Release	Size at Release	Release Location	Estimated Adult Survival														
					Umatilla River		Washington /1		Lyons Ferry		Washington Hatcheries				Spawn Grounds /2		Fish Traps		
					No.	%	No.	%	No.	%	Priest Rapids	Wells Dam	No.	%	No.	%	No.	%	
<u>Subyearling fall releases (Priest Rapids stock)</u>																			
87	14408	Nov 88	9.0	Mnthorn	2	5.0	38	95.0	10	26.3	9	237	10	26.0					
87	79881	Nov 88	8.6	Nr. Minthorn	49	66.2	25	33.8	13	32.0	4	160	1	4.0	3	120	3	120	
88	70825	Oct 89	10.9	Mnthorn	9	56.3	7	43.6	5	71.4			2	28.6					
88	<u>78132</u> <u>251048</u>	Oct 89	11.1	Nr. Minthorn	<u>5</u> <u>65</u>	<u>38.5</u> <u>45.5</u>	<u>8</u> <u>78</u>	<u>61.5</u> <u>54.5</u>	<u>6</u> <u>34</u>	<u>75.0</u> <u>43.6</u>	<u>1</u> <u>14</u>	<u>125</u> <u>17.9</u>	<u>1</u> <u>14</u>	<u>12.5</u> <u>17.9</u>	3	3	8	3	3.8
<u>Yearling spring releases (Bonneville stock)</u>																			
81	100564	April 83	5.9	Bonifer & Meacham Cr	0	0.0	2	100.0	2	100.0									
82	175104	April 84	8.6	Bonifer & Meacham Cr.	0	0.0	5	100.0	5	100.0									
83	198182	Mar 85	7.8	Uma. R. (RM 87) a Bonifer	2	2.2	88	97.8	81	92.0	7	8.0							
84	91036	Mar 86	4.8	Bonifer & Minthorn	61	35.1	113	64.9	45	39.8	4	3.5			58	51.3	6	5.3	
85	109143	Mar 87	8.1	Mnthorn	201	87.4	29	12.6	18	62.1	4	13.6			7 /8	24.1			
85	102383	Mar 87	8.8	Bonifer	112	61.9	69	38.1	69	100.0									
86	100791	Mar 88	8.8	Mnthorn	274	85.6	46	14.4	35	78.1					11	23.9			
86	<u>99550</u> <u>976713</u>	Apr 88	10.2	Bonifer	<u>207</u> <u>857</u>	<u>62.6</u> <u>68.5</u>	<u>43</u> <u>365</u>	<u>17.2</u> <u>31.5</u>	<u>38</u> <u>293</u>	<u>88.4</u> <u>74.2</u>	<u>3</u> <u>18</u>	<u>7.0</u> <u>4.6</u>	<u>1</u> <u>1</u>	<u>2.3</u> <u>0.3</u>	<u>1</u> <u>77</u>	<u>2.3</u> <u>19.5</u>	<u>6</u>	<u>1.5</u>	

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/1 Estimated Washington recoveries above McNary Dam.
 /2 Ringold unless otherwise noted.
 /3 Approximately 48.7% of the fish were released at RM 1.5 and 51.3% at RM 51.5.
 /4 Ten from Linn Ferry.
 /5 Twenty-four from the Tucannon River, 24 from the Yakima River, and 12 from Priest Rapids.
 /6 From the Snake River.

Spring Chinook

The first coded-wire tagged releases of spring chinook in the Umatilla River were in 1988 from Carson stock (Table 24). Two groups (1986 brood) were released in April (one acclimated group from Bonifer and one group between Umatilla RM 23 and RM 2 of Meacham Creek), and two groups (1987 brood) were released in November (one group from Bonifer and one group into the upper Umatilla River at RM 89). The purpose for the releases was to evaluate acclimation, but several problems were encountered in both the spring and fall experiments (Lofy 1989). These problems essentially eliminate any possible comparison between acclimated and non-acclimated fish.

The estimated survival rates (through age-6 fish; preliminary data) for the spring release groups are 0.74 and 0.72%. Approximately 80.3% of the fish recovered have been from the Umatilla River and 19.6% have been recovered from the Columbia River. The preliminary recovery rate (through age-5 fish) of the acclimated group released in the fall is 0.50%, but less than 1,200 fish were released and recoveries have been minimal. Recoveries from the group of fish released at RM 89 have also been low (0.09%; preliminary data). All but three of the adult recoveries from the fall releases have been from the Umatilla River.

In the spring of 1989, a third acclimation experiment was conducted. One group of fish was acclimated at Bonifer, while a control group was released into Meacham Creek concurrent with the acclimated group. Both groups were released at 10.6/lb. Preliminary data (through age-5 fish) suggests that survival of the control group (0.34%) is higher than survival of the acclimated group (0.28%). Estimated Umatilla River recoveries from the acclimated and non-acclimated releases are similar (84.6 and 81.2%, respectively). Evaluation of this experiment is complicated however, because of difficulties with releasing the acclimated group (Lofy et al. 1990). Table 24 shows the release date as March to May. The fish were transferred into Bonifer on March 7, but many fish escaped on March 10 because of plugged effluent screens which resulted in the pond overflowing. Observations during steelhead acclimation that followed, showed that several thousand spring chinook were still in the pond and were released with the steelhead on May 23. The date of release for this group was therefore recorded as March 10 to May 23, 1989.

Two other acclimation evaluation experiments have been performed at Bonifer. One experiment was conducted in the fall of 1989 and another experiment was conducted in the spring of 1990 (Table 24). Both releases were from 1988 brood. Estimated survival rates (through age-4 fish; preliminary data) for both acclimated and non-acclimated groups for both experiments are similar. The survival rates of the acclimated and non-acclimated groups released in the fall are 0.03 and 0.04%, respectively. This is much lower than the survival of the fish held longer at the hatchery and released the following spring (0.20 and 0.22%).

Table 24. Liberation and survival information for spring chinook salmon released in the Umatilla Ri.

Brood	Number Released	Date of Release	Size at Release	Number Tagged	CWT Code	Release Location	Estimated Adult Survival			
							%	Total	Columbia River	Umatilla River
86	35846	Mar-Apr 88	10.1	26640	074325	Bonifer	0.63	226	30 /1	196
86	35148	Mar-Apr 88	10.1	25863	074326	Bonifer	0.96	339	90	241
06	35137	Mar-Apr 88	10.1	25853	074327	Bonifer	0.63	222	53 /2	169
Total	106231			70356			0.74	787	181	606
86	34107	Apr 88	8.6	26319	074328	Uma.R. (RM 23-81)	0.52	179	27	152
06	33573	Apr 88	0.6	25722	074329	Uma.R. (RM 23-81)	0.75	251	40 13	211
86	34118	Apr 88	0.6	26252	074330	Uma.R. (RM 23-81)	0.88	299	49	250
Total	101078			70293			0.72	729	116	612
87	416	Nov 88	21.4	410	074420	Bonifer	0.00	0	0	0
87	399	Nov 88	21.4	393	074423	Bonifer	0.75	3	0	3
87	381	Nov 88	21.4	376	074424	Bonifer	0.79	3	0	3
Total	1116			1179			0.50	6	0	6
87	26109	Nov 88	11.1	25987	074427	Corp. Cr.	0.08	21	0	21
07	24183	Nov 88	11.1	24070	074429	Corp. a.	0.09	22	3	19
87	25475	Nov 88	11.1	25356	074430	Corp. Cr	0.10	26	0	26
Total	75767			75413			0.09	69	3	66
87	26135	Mar-May 89	10.6	25427	074433	Bonifer	0.30	70	11	67
07	27756	Mar-May 89	10.6	27004	074434	Bonifer	0.29	81	9	72
87	26093	Mar-May 89	10.6	25386	074436	Bonifer	0.24	62	14	48
Total	79904			77017			0.28	221	34	187
87	28153	Mar 89	10.6	27505	074439	Nr. Bonifer	0.33	93	24	69
87	28116	Mar 89	10.6	27550	074440	Nr. Bonifer	0.30	107	15	92
07	24563	Mar 89	10.6	24165	074443	Nr. Bonifer	0.32	zz	13	64
Total	80932			79300			0.34	277	52	225
88	24960	Oct 89	12.0	24001	075063	Bonifer	0.03	0	5	3
88	20299	Oct 89	12.0	28109	075101	Bonifer	0.02	5	0	5
00	27483	Oct 89	12.0	27299	076102	Bonifer	0.04	12	4	8
Total	00750			00209			0.03	25	9	16
88	27207	Oct 89	12.0	27137	075103	Nr. Bonifer	0.03	0	0	0
88	20710	Oct 89	12.0	28560	075104	Nr. Bonifer	0.07	20	12	8
88	27848	Oct 89	12.0	27695	075105	Nr. Bonifer	0.02	5	0	5
Total	83853			03392			0.04	33	12	21
88	30224	March 90	9.0	26630	075106	Bonifer	0.19	73	24	49
88	37530	March 90	9.0	26160	075107	Bonifer	0.23	85	43	42
88	38583	March 90	9.0	26888	075108	Bonifer	0.17	65	29	36
Total	114345			79686			0.20	223	96	127
88	39012	March 90	9.6	25611	075109	Nr. Bonifer	0.22	85	32	53
88	40072	March 90	9.6	26307	075110	Nr. Bonifer	0.26	102	50	52
88	38343	March 90	9.6	25172	075111	Nr. Bonifer	0.17	66	26	40
Total	117427			77090			0.22	253	100	145

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Coho

Coded-wire tagged yearling coho salmon have been released into the Umatilla River since 1987 (Table 25). These fish have been from Tanner Creek stock reared at Cascade Hatchery.

The first release was from Minthorn in April, 1987. The average survival rate was 1.60%. The highest percentage of the recoveries was in the ocean (58.0%), while recoveries in the Columbia River and Umatilla River were 38.6 and 3.4%, respectively. Exploitation of this release was 94.9%. Exploitation rates in the commercial ocean and Columbia River gillnet fisheries were 41.1 and 26.9%, respectively. The sport fishery accounted for 27.0% of the catch while no fish were captured in the treaty fishery.

The second release of coded-wire tagged coho was in the lower Umatilla River in March, 1988 (Table 25). These fish were smaller than the fish released in 1987, but overall survival was much higher (4.14%). The ocean harvest rate (58.5%) was similar to the recovery rate for the 1987 release (58.0%). The recovery rates in the Columbia and Umatilla rivers (25.7 and 15.8%, respectively) differed however. Exploitation of this release (83.3%) was lower than the exploitation rate for the 1987 releases (94.9%). Exploitation rates in the commercial ocean and Columbia River gillnet fisheries were 32.1 and 18.0%, respectively. The exploitation rates in the sport and treaty fisheries were 31.0 and 2.3%, respectively.

Two groups of coho were released in 1989 (Table 25). One group was acclimated at Minthorn and a control group was released into the Umatilla River at the same time as the acclimated release. Estimated survival of the acclimated group was nearly twice that of the control group (1.03 versus 0.55%, respectively). The percentages of the acclimated fish recovered in the ocean, Columbia River, and Umatilla River were 75.0, 14.2 and 10.9%, respectively. The percentages of the control fish recovered were 61.0, 29.7 and 9.3%, respectively. The estimated recovery rate of adults in the Umatilla River from the acclimated release (0.11%) was also twice that of the control group (0.05%). These recovery rates suggest that acclimation provided a benefit toward overall survival and survival back to the Umatilla River. The exploitation rates on the acclimated and non-acclimated groups were 85.3 and 87.9%, respectively.

Three groups of coho (1988 brood) were released in the spring of 1990 (Table 25). One group was acclimated at Minthorn for 21 days and released in March, while a non-acclimated group was released instream concurrent with the acclimated group. A third group was held at Minthorn and given the opportunity to voluntarily release (Rowan 1991). Very few fish voluntarily left the pond however, and they were crowded out of the pond in April after being held for 36 days. The size at release for this group of fish (11.2/lb.) was higher than the average size of the acclimated and control groups (13.5 and 13.3/lb.).

Table 25. Liberation and survival information for coho salmon released in the Umtilla River. /1

Brood	Number Released	Date of Release	Size at Release	Number Tagged	CWT Code	Release Location	Estimated Adult Survivals				
							%	Total	Ocean	Col.R.	Uma.R.
85	37245	Apr 87	13.5	13440	073617	Minthorn	1.86	692	346	310	36
85	53754	Apr 87	13.5	19879	073624	Minthorn	1.57	646	522	300	24
85	<u>70890</u>	Apr 87	13.5	<u>26740</u>	073625	Minthorn	<u>1.49</u>	<u>1055</u>	<u>636</u>	<u>392</u>	<u>27</u>
Total	161609			60059			1.60	2593	1504	1002	07
86	68208	Mar 88	16.8	20592	074356	Lower Umtilla R.	4.28	2918	1679	858	381
86	73650	Mar 88	17.3	18963	074357	Lower Umtilla R.	4.06	2990	1724	746	520
86	<u>61606</u>	Mar 88	15.7	<u>18513</u>	074358	Lower Umtilla R.	<u>4.08</u>	<u>2516</u>	<u>1521</u>	<u>562</u>	<u>433</u>
Total	203464			58068			4.14	8424	4924	2166	1334
07	75970	Mar 89	17.2	27062	074609	Nr. Minthorn	0.55	418	255	124	39
07	72627	Mar 89	17.3	26416	074610	Minthorn	1.01	732	531	121	80
87	<u>84672</u>	Mar 89	19.1	<u>26739</u>	074611	Minthorn	<u>1.04</u>	<u>881</u>	<u>678</u>	<u>108</u>	<u>95</u>
Total	157299			53155			1.03	1613	1209	229	175
88	67309	Mar 90	13.5	28033	074814	Minthorn	3.00	2022	800	1044	178
88	59682	Mar 90	13.3	26881	074013	Nr. Minthorn	3.07	1835	702	913	140
88	65095	Apr 90	11.2	27226	074015	Minthorn	3.96	2577	1121	1255	201
89	152974	Mar 91	15.4	24584	075535	Minthorn	0.25	386	243	118	25
89	449670	Mar 91	16.5	25905	075534	Uma Rm 56-60	0.17	746	295	347	104
89	352977	Mar 91	16.0	24851	075533	Uma Rm 63-70	0.15	526	298	114	114
90	472221	Mar 92	15.5	27908	075620	Uma Rm 56	0.01	34	0	0	34
90	244615	Mar 92	15.7	27705	075621	Uma Rm 60	0.00	0	0	0	0
90	<u>244550</u>	Mar 92	15.7	<u>27458</u>	075622	Uma Rm 60	<u>0.01</u>	<u>27</u>	<u>0</u>	<u>0</u>	<u>27</u>
Total	961386			83071			0.01	61	0	0	61

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/1 Survival data for the 1990 brood includes age-2 fish only (1992 returns).

The estimated survival rates of the acclimated group released in March and the non-acclimated control group are similar (3.0 and 3.1%, respectively). The estimated survival rates to the Umatilla River are also similar for the acclimated and control groups (0.26 and 0.23%, respectively). Unlike the experiment conducted in 1989, the data for the 1990 releases indicate no benefit of acclimation to overall survival and only a slight increase in survival back to the Umatilla River. The overall survival of the group held longer at Minthorn is much higher, however (3.96%). The return to the Umatilla River is also higher (0.31%). It is difficult to know whether the increase in survival is a result of increased acclimation time or a larger mean weight at release. Both factors may be beneficial in increasing adult survival.

An estimated 42.0% of the recoveries from all groups were recovered in the ocean fisheries. This is lower than the ocean recovery rates for the 1985 through 1987 broods (58.0, 58.5 and 72.1%, respectively). Columbia River recoveries (49.9%) were higher than the three previous broods (17.4 to 38.6%). Umatilla River recoveries (8.1%) were similar (10.5 to 15.8%). The exploitation rates were similar for all three groups and averaged 85.9%, similar to the exploitation rates of the 1988 and 1989 releases (83.3 and 85.9%, respectively). An estimated 47.4% were recovered in the ocean and Columbia River sport fisheries, while the commercial ocean and Columbia River net fishery recoveries were 24.3 and 28.3%, respectively. No fish were recovered in the treaty fisheries.

Three groups of coho were released into the Umatilla River in 1991 (Table 25). One group was acclimated at Minthorn for 20 days prior to release on March 25, while the other two groups were released directly into the Umatilla River between March 21 and March 26. Estimated survival rates of the direct stream release groups are 0.17 and 0.15% (preliminary data). Survival of the acclimated group is 0.25%, however. An estimated 50.4% of the recoveries from all groups have been from the ocean fisheries, and 34.9 and 14.7% have been from the Columbia and Umatilla Rivers, respectively.

Summary of Expenditures

Expenditures for activities associated with the operation, maintenance and evaluation of Bonifer and Minthorn Acclimation Facilities in 1992 totaled \$159,602.88 (Table 26).

Table 26. Expenditures for Bonifer and Minthorn Facilities operation, maintenance and evaluation in 1992.

Line Item	Expenditure
Personnel	87,282.82
Travel (all)	601.48
Fish Food	4,858.00
Property Lease	314.62
Facility Use Fees	924.00
Electricity/Utilities (Minthorn)	1,068.00
Materials and Supplies	5,311.20
Communications (telephone/alarm)	1,156.88
Repairs and Maintenance (equipment servicing)	814.06
Printing/Duplication	455.30
Equipment Rental (GSA mileage, rental & service)	7,182.79
Equipment Rental (General)	450.94
Training	605.00
Office Supplies	449.37
Non-capital Equipment	2,277.60
	<hr/>
	SUBTOTAL:
	113,752.06
Indirect	34,239.37
Sub-contract	11,611.45
	<hr/>
	TOTAL:
	159,602.88

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APPENDICES

Appendix A. Summary of hourly temperature data at Minthorn Acclimation Facility in 1992.

Day	January			February			March		
	Min.	Max.	Ave.	Min.	Max.	Ave.	Min.	Max.	Ave.
1	7.5	8.1	7.7	7.4	8.4	7.8	7.4	8.4	7.9
2	7.4	8.6	7.9	6.4	8.5	7.5	7.8	8.3	8.1
3	6.9	8.1	7.5	6.1	8.1	7.1	7.6	9.2	8.2
4	7.7	8.5	8.0	5.6	7.8	6.7	6.5	10.3	8.2
5	7.4	7.9	7.6	5.5	7.3	6.5	6.9	9.5	8.1
6	7.4	8.0	7.6	6.7	7.3	7.0	7.4	9.2	8.3
7	6.3	7.5	7.1	6.7	7.3	7.0	8.1	9.8	8.8
8	5.5	7.1	6.3	6.7	8.2	7.5	6.8	10.3	8.4
9	5.9	6.9	6.4	7.1	8.2	7.6	6.5	10.5	8.3
10	6.2	7.3	6.6	7.2	7.9	7.5	6.5	10.5	8.4
11	6.8	7.5	7.2	7.2	8.9	7.9	6.6	10.9	8.6
12	6.2	7.4	6.9	6.9	8.1	7.5	6.7	11.1	8.7
13	6.5	7.5	7.0	6.9	9.1	7.9	6.9	11.1	8.9
14	7.2	8.1	7.7	7.0	8.9	7.9	7.1	10.8	9.0
15	7.0	7.8	7.3	6.9	8.2	7.8	8.4	11.6	9.8
16	7.1	7.6	7.3	5.6	8.3	7.0	7.5	10.7	9.1
17	7.2	7.7	7.4	6.6	8.7	7.6	8.0	10.3	8.9
18	6.6	7.1	6.9	6.7	8.2	7.5	6.9	11.2	8.9
19	6.6	6.9	6.7	7.5	8.5	8.0	6.4	10.5	8.4
20	6.4	6.7	6.6	7.4	8.4	7.8	6.6	11.0	8.7
21	6.2	7.3	6.7	6.9	9.1	7.9	6.4	10.8	8.5
22	6.3	7.8	7.0	7.1	8.8	7.8	6.4	11.0	8.6
23	7.7	8.3	8.0	6.9	9.0	7.9	6.7	11.5	9.0
24	8.0	8.8	8.3	7.8	9.6	8.5	7.4	11.9	9.5
25	7.5	8.5	7.9	8.0	8.7	8.3	7.1	11.7	9.4
26	6.1	7.5	7.0	7.9	8.9	8.2	8.2	11.0	9.5
27	6.6	8.0	7.3	7.8	8.5	8.1	8.1	10.3	9.1
28	7.8	8.9	8.1	7.8	8.5	8.1	6.3	10.8	8.5
29	7.5	9.1	8.2	7.7	8.5	8.0	7.1	11.5	9.2
30	7.6	8.7	8.1				7.1	11.4	9.3
31	7.7	8.2	7.9				7.4	12.3	9.8
Total	5.5	9.1	7.4	5.5	9.6	7.7	6.3	12.3	8.8

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Appendix A. (Cont.)

Day	April			May			June		
	Min.	Max.	Ave.	Min.	Max.	Ave.	Min.	Max.	Ave.
1	7.8	12.8	10.2	8.6	13.7	11.0	12.3	16.7	14.6
2	8.0	13.2	10.6	8.5	14.3	11.3	12.5	16.9	14.5
3	8.8	11.3	10.2	8.9	14.9	11.8	11.5	16.2	13.7
4	8.5	11.1	9.8	9.4	15.3	12.2	11.6	16.7	14.1
5	7.7	10.0	9.0	9.5	15.4	12.4	12.0	16.7	14.3
6	7.5	10.8	9.0	9.8	15.7	12.6	11.9	16.8	14.5
7	6.7	9.2	8.1	10.7	16.0	13.2	12.6	16.9	14.7
8	7.7	10.4	9.1	10.0	12.3	11.2	12.3	17.6	14.9
9	8.7	10.3	9.5	9.4	13.2	11.4	12.6	17.3	15.0
10	8.9	11.3	9.9	10.1	14.3	12.0	12.9	16.7	14.9
11	8.3	10.5	9.5	9.4	13.4	11.3	12.9	17.0	14.9
12	8.8	10.5	9.7	8.7	13.8	11.3	12.2	15.0	13.2
13	9.2	12.1	10.5	10.1	14.5	12.1	11.9	14.7	13.1
14	8.5	12.6	10.5	9.8	15.0	12.4	11.9	15.3	13.4
15	8.5	13.1	10.8	10.8	15.6	13.1	12.4	13.4	13.0
16	9.5	11.3	10.4	10.0	15.6	12.7	12.6	15.4	13.8
17	9.1	11.1	10.0	10.1	14.9	12.5	12.4	18.0	15.0
18	8.6	12.1	10.0	11.2	15.2	13.3	12.8	18.6	15.6
19	8.0	13.4	10.6	10.9	15.6	13.2	13.4	19.0	16.0
20	8.7	12.7	10.7	11.2	14.7	12.7	13.5	19.0	16.1
21	8.8	11.1	10.0	9.8	15.0	12.3	13.6	18.2	15.9
22	8.1	12.3	10.0	9.8	15.1	12.5	13.7	19.4	16.5
23	7.7	12.8	10.1	10.6	16.0	13.3	14.2	19.6	17.0
24	7.8	12.6	10.3	11.1	16.7	13.9	14.4	19.7	17.0
25	8.6	13.6	11.1	11.6	17.1	14.2	14.7	18.2	16.5
26	9.1	12.6	10.9	12.6	15.4	14.0	14.8	19.4	17.1
27	9.2	13.8	11.5	11.4	16.0	13.7	14.4	19.9	17.1
28	9.7	14.5	12.1	11.6	15.4	13.7	15.0	17.3	16.2
29	9.8	12.4	11.2	12.2	15.9	14.0	14.2	18.0	15.9
30	9.8	13.0	11.0	11.8	16.8	14.2	13.7	17.1	15.3
31				11.9	17.4	14.6			
Total	6.7	14.5	10.2	8.5	17.4	12.7	11.5	19.9	15.1

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Appendix A. (Cont.)

Day	July			August			September		
	Min.	Max.	Ave.	Min.	Max.	Ave.	Min.	Max.	Ave.
1	14.0	18.0	15.9	15.6	20.5	17.7	14.7	19.1	16.7
2	13.9	18.5	16.1	14.8	20.2	17.2	14.8	19.2	16.7
3	13.9	18.9	16.2	14.7	20.4	17.2	14.7	17.9	16.3
4	14.5	17.1	15.6	14.7	19.9	17.0	15.0	17.1	16.0
5	13.9	17.6	15.6	14.4	19.1	16.6	14.3	17.4	15.5
6	13.7	17.1	15.4	14.7	18.0	16.3	13.4	16.9	14.8
7	14.0	18.3	16.0	15.1	19.0	16.8	12.6	16.9	14.7
8	13.7	19.0	16.2	14.7	19.5	16.8	14.1	17.4	15.5
9	13.9	19.7	16.5	14.5	19.6	16.7	14.1	18.0	15.8
10	13.9	18.2	15.9	14.4	19.5	16.7	13.4	17.7	15.5
11	14.7	18.7	16.3	15.2	20.4	17.6	14.7	18.3	16.3
12	13.8	19.7	16.5	15.3	20.5	17.7	13.9	16.2	15.0
13	14.9	19.7	17.0	16.4	21.4	18.6	13.1	16.2	14.3
14	14.4	19.7	16.8	15.9	21.0	18.3	12.3	15.5	13.9
15	14.0	20.0	16.7	16.3	20.0	18.0	13.7	15.5	14.5
16	13.9	20.2	16.9	15.6	19.7	17.5	14.0	17.2	15.3
17	14.5	20.6	17.4	15.4	20.8	17.9	13.6	16.8	14.9
18	15.0	19.0	17.0	15.5	20.7	17.8	12.1	16.4	14.1
19	15.4	20.4	17.5	15.2	20.0	17.5	13.5	17.0	15.1
20	15.4	19.1	17.1	15.2	20.0	17.4	14.4	17.4	15.8
21	15.3	20.3	17.5	15.8	18.7	17.0	14.4	17.7	16.0
22	15.0	16.9	15.6	14.6	16.2	15.3	13.9	17.3	15.6
23	14.3	15.3	14.8	13.9	18.3	15.7	14.4	17.2	15.8
24	14.6	19.6	16.7	13.3	18.2	15.5	14.2	15.8	14.7
25	14.5	20.0	17.0	13.6	18.5	15.8	13.5	15.8	14.5
26	14.7	20.5	17.3	13.7	18.9	16.0	13.1	16.1	14.6
27	14.7	20.2	17.2	14.3	19.3	16.5	13.2	15.8	14.4
28	14.7	20.2	17.1	15.1	19.1	16.8	12.3	15.5	13.8
29	15.0	20.6	17.4	13.9	18.6	16.0	12.3	15.6	14.0
30	15.0	20.8	17.6	14.1	19.1	16.3	13.1	16.2	14.7
31	15.3	20.8	17.7	14.9	18.5	16.5			
Total	13.7	20.8	16.6	13.3	21.4	16.9	12.1	19.2	15.2

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Appendix A. (Cont.)

Day	October			November			December		
	Min.	Max.	Ave.	Min.	Max.	Ave.	Min.	Max.	Ave.
1	13.6	16.1	14.8	12.3	13.1	12.7	8.7	10.0	9.3
2	14.1	16.2	15.1	11.3	12.5	11.8	8.6	9.9	9.2
3	14.0	15.0	14.4	10.3	12.0	11.1	6.9	8.8	7.9
4	13.3	15.1	14.2	10.8	12.3	11.5	6.4	8.4	7.4
5	11.8	14.5	13.2	11.6	13.0	12.2	7.4	8.3	7.8
6	11.8	14.1	13.0	11.3	12.6	11.9	6.6	8.1	7.5
7	11.0	13.8	12.5	11.4	12.0	11.7	7.3	8.5	7.9
8	12.4	14.2	13.3	10.9	11.5	11.2	7.1	9.2	8.2
9	12.3	14.4	13.4	10.5	11.4	10.9	8.4	9.8	9.1
10	12.1	14.7	13.4	9.5	11.1	10.3	8.5	9.6	9.1
11	12.6	14.8	13.7	9.8	11.3	10.6	7.7	9.2	8.4
12	12.0	20.5	16.1	11.3	12.1	11.6	8.5	9.5	8.9
13	13.1	14.9	14.2	11.2	11.7	11.4	8.1	9.8	9.0
14	11.7	13.1	12.5	11.1	11.6	11.4	8.8	10.1	9.4
15	10.7	12.3	11.7	11.1	11.6	11.3	8.4	9.2	8.8
16	11.0	12.8	12.0	10.8	11.5	11.2	6.9	8.1	7.6
17	11.9	13.9	12.9	9.8	11.1	10.5	7.1	9.1	8.3
18	11.8	13.6	12.8	10.0	11.8	10.9	6.8	8.1	7.4
19	12.6	14.7	13.5	9.7	11.1	10.3	7.1	9.5	8.1
20	11.6	14.3	13.1	9.9	11.1	10.3	6.9	9.1	8.3
21	13.1	13.9	13.4	8.5	9.9	9.2	8.6	9.5	8.9
22	11.8	14.1	13.1	9.5	10.5	10.2	8.5	9.5	9.0
23	12.1	14.4	13.2	9.1	10.5	9.9	8.1	10.1	9.1
24	11.6	13.7	12.7	8.1	9.7	8.9	7.8	9.6	8.4
25	11.3	13.4	12.4	8.4	9.2	8.9	7.1	8.9	7.9
26	11.1	13.3	12.2	8.5	9.2	8.8	8.1	9.6	9.0
27	10.5	12.7	11.6	8.3	9.9	9.2	8.1	9.5	8.8
28	11.1	11.9	11.5	9.5	10.5	9.9	7.4	8.7	8.2
29	11.3	12.2	11.7	9.1	10.0	9.5	6.6	7.5	7.1
30	11.3	12.6	11.9	9.4	10.7	9.9	6.3	7.6	6.9
31	11.6	12.6	12.2				6.4	6.9	6.6
Total	10.5	20.5	13.1	8.1	13.1	10.6	6.3	10.1	8.3

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File Name: C:\123R3\DATA\MNTMP92

Appendix B. Summary of hourly temperature data at Bonifer Acclimation Facility in 1992.

Day	January			February			March		
	Min.	Max.	Ave.	Min.	Max.	Ave.	Min.	Max.	Ave.
1	6.0	6.9	6.3	7.3	7.8	7.6	7.1	7.8	7.5
2	6.2	7.1	6.5	6.7	8.4	7.6	6.9	8.4	7.7
3	4.8	6.4	5.8	6.0	7.4	6.9	7.8	8.4	8.1
4	6.1	6.8	6.5	5.6	7.0	6.1	6.7	8.2	7.5
5	6.2	6.8	6.5	5.4	6.5	6.1	7.4	8.7	8.1
6	6.3	7.0	6.5	6.3	6.8	6.6	7.4	8.4	7.7
7	5.6	6.7	6.3	6.2	6.5	6.4	7.5	8.1	7.9
8	4.2	5.6	5.0	6.1	7.1	6.7	7.4	9.5	8.5
9	4.0	5.1	4.7	6.8	8.5	7.8	7.1	9.2	8.3
10	4.7	6.0	5.3	7.6	8.6	8.2	7.1	8.7	7.9
11	5.4	6.4	5.8	7.6	9.0	8.4	7.1	9.4	8.3
12	5.7	6.9	6.2	7.1	8.2	7.5	7.4	10.3	8.8
13	5.6	6.1	5.8	6.7	8.5	7.5	8.1	10.5	9.4
14	6.0	7.0	6.4	7.4	9.5	8.3	9.0	11.0	10.0
15	6.3	7.6	6.7	7.1	8.4	7.8	9.8	11.8	10.8
16	6.6	7.1	6.8	5.8	7.7	6.8	9.2	10.4	9.9
17	6.7	7.6	6.9	6.1	8.0	7.1	8.8	9.8	9.3
18	6.0	6.7	6.4	6.8	7.4	7.2	8.3	10.8	9.0
19	5.6	6.3	5.9	7.1	7.9	7.5	7.7	10.1	9.1
20	5.2	5.8	5.5	7.8	8.2	7.9	7.7	10.2	9.1
21	4.9	6.6	5.6	7.1	8.8	7.9	8.0	10.3	9.3
22	4.7	7.0	5.6	7.8	9.0	8.3	7.8	10.2	9.1
23	6.5	7.6	6.9	7.4	9.1	8.2	7.8	10.3	9.2
24	7.2	7.6	7.4	8.1	8.9	8.5	8.1	11.2	9.8
25	7.4	8.6	7.9	7.2	8.5	8.0	8.3	11.1	10.0
26	6.7	8.0	7.1	8.0	8.9	8.4	8.8	10.6	10.0
27	6.6	7.3	6.9	6.9	8.6	8.0	9.0	10.2	9.8
28	7.1	8.9	7.8	7.3	8.7	8.0	7.2	10.5	8.7
29	7.6	8.9	8.2	7.6	8.0	7.8	6.4	14.4	9.1
30	7.7	8.5	8.1				5.5	11.1	8.8
31	7.6	8.2	8.0				7.4	13.1	10.2
Total	4.0	8.9	6.5	5.4	9.5	7.5	5.5	14.4	8.9

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Appendix B. (Cont.)

Day	April			May			June		
	Min.	Max.	Ave.	Min.	Max.	Ave.	Min.	Max.	Ave.
1	9.6	13.1	11.4	9.2	11.9	10.5	13.9	14.9	14.3
2	10.5	14.0	12.2	9.8	12.5	11.1	13.9	15.2	14.5
3	11.3	12.5	11.9	10.3	12.9	11.6	14.2	15.1	14.6
4	10.3	11.8	11.0	10.8	13.6	12.2	13.4	15.0	14.1
5	9.2	10.5	10.0	10.9	13.6	12.3	13.6	14.9	14.1
6	8.5	10.8	9.6	11.0	13.9	12.4	14.3	15.4	14.8
7	7.8	9.4	8.4	11.7	14.8	13.0	14.9	16.1	15.5
8	7.8	9.2	8.5	11.3	13.2	12.1	15.4	16.2	15.8
9	8.8	9.7	9.3	10.8	12.3	11.4	15.6	16.6	16.0
10	9.1	10.3	9.7	11.0	14.0	12.4	16.2	17.0	16.6
11	8.9	10.3	9.7	11.3	13.4	12.1	16.3	17.1	16.7
12	9.6	10.8	10.1	10.2	11.6	10.9	14.9	16.5	15.9
13	9.7	12.0	10.7	10.9	11.9	11.3	13.2	14.8	13.7
14	9.5	12.8	11.1	11.3	12.8	11.8	12.6	13.3	13.0
15	10.0	12.7	11.6	11.6	13.7	12.4	12.3	12.8	12.6
16	10.9	12.0	11.5	11.3	13.0	12.1	12.2	12.4	12.3
17	10.0	11.1	10.5	11.3	12.5	12.0	12.4	13.2	12.6
18	9.2	10.7	9.9	12.0	13.3	12.5	13.4	15.6	14.3
19	8.2	12.3	10.4	12.1	13.2	12.6	15.7	16.5	16.1
20	10.2	12.8	11.3	12.3	14.2	13.1	16.5	17.0	16.8
21	8.4	12.3	9.8	11.8	12.9	12.2	17.1	17.6	17.4
22	7.8	12.3	9.1	11.6	12.6	12.0	17.5	18.0	17.7
23	6.8	13.2	9.5	12.1	13.0	12.4	17.7	18.0	17.9
24	7.1	12.8	9.7	12.4	13.4	12.8	17.6	17.8	17.7
25	8.0	15.0	10.5	12.9	14.4	13.5	17.6	17.8	17.7
26	8.3	13.9	10.4	13.4	13.9	13.6	17.7	17.9	17.8
27	8.6	14.0	11.1	12.9	13.6	13.3	17.9	18.2	18.1
28	9.8	13.7	11.6	13.0	13.8	13.3	18.1	18.3	18.3
29	10.6	12.2	11.5	13.0	13.7	13.3	17.8	18.1	18.0
30	10.0	12.1	10.9	13.3	14.3	13.6	17.4	17.8	17.6
31				13.6	14.4	13.9			
Total	6.8	15.0	10.4	9.2	14.8	12.4	12.2	18.3	15.7

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Appendix B. (Cont.)

Day	July			August			September		
	Min.	Max.	Ave.	Min.	Max.	Ave.	Min.	Max.	Ave.
1	17.1	17.4	17.2	15.3	15.3	15.3	13.7	13.9	13.9
2	16.8	17.1	16.9	15.3	15.5	15.4	13.7	13.9	13.8
3	16.8	16.8	16.8	15.4	15.6	15.5	13.6	13.8	13.7
4	16.8	17.0	16.9	15.2	15.4	15.3	13.6	13.9	13.8
5	16.8	17.0	16.9	15.1	15.3	15.3	13.7	13.9	13.9
6	16.8	16.8	16.8	15.3	15.3	15.3	13.6	13.8	13.7
7	16.5	16.8	16.7	15.0	15.3	15.1	13.3	13.7	13.5
8	16.4	16.5	16.4	15.0	15.1	15.0	12.8	13.3	13.1
9	16.4	16.8	16.6	15.0	15.1	15.0	12.6	13.0	12.8
10	16.7	16.8	16.8	15.0	15.0	15.0	12.6	12.7	12.6
11	16.4	16.7	16.5	15.0	15.1	15.0	12.6	15.6	13.7
12	16.0	16.4	16.2	15.0	15.2	15.1	13.3	15.5	14.0
13	15.9	16.0	16.0	15.0	15.2	15.1	11.3	13.2	12.0
14	16.0	16.3	16.1	15.2	15.5	15.3	10.3	11.6	10.9
15	16.2	16.4	16.4	15.5	15.8	15.6	10.5	11.5	11.0
16	16.4	16.5	16.4	15.8	15.9	15.9	11.6	12.2	11.9
17	16.2	16.3	16.2	15.9	16.0	16.0	12.0	13.2	12.4
18	16.1	16.2	16.2	15.9	16.1	16.0	11.2	12.6	11.7
19	16.2	16.2	16.2	15.7	15.9	15.9	11.1	11.5	11.3
20	16.2	16.5	16.3	15.6	15.7	15.6	11.3	11.7	11.5
21	16.3	16.5	16.4	15.6	15.6	15.6	11.9	12.2	12.1
22	16.2	16.4	16.3	15.4	15.6	15.6	12.1	12.8	12.4
23	15.6	16.2	16.0	15.0	15.4	15.2	12.8	13.1	13.0
24	14.7	15.6	15.1	13.7	15.0	14.4	13.1	13.9	13.4
25	14.1	14.7	14.3	13.5	13.8	13.6	12.8	13.9	13.2
26	14.3	14.7	14.5	13.4	13.5	13.4	12.4	12.8	12.6
27	14.7	15.0	14.9	13.4	13.5	13.4	12.1	12.5	12.3
28	15.0	15.2	15.1	13.4	13.6	13.5	12.1	12.2	12.1
29	15.2	15.3	15.2	13.5	13.7	13.6	11.9	12.2	12.1
30	15.0	15.3	15.2	13.6	13.8	13.7	11.8	12.2	12.0
31	15.0	15.3	15.2	13.6	13.9	13.7			
Total	14.1	17.4	16.1	13.4	16.1	14.9	10.3	15.6	12.7

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Appendix B. (Cont.)

Day	October			November			December		
	Min.	Max.	Ave.	Min.	Max.	Ave.	Min.	Max.	Ave.
1	12.0	12.1	12.1	9.4	10.1	9.9	6.6	6.9	6.8
2	12.1	12.3	12.2	10.0	10.3	10.2	6.4	6.7	6.5
3	12.3	12.5	12.4	9.2	10.1	9.6	6.0	6.7	6.3
4	12.3	12.5	12.4	8.7	9.3	8.9	4.9	6.1	5.4
5	12.0	12.5	12.2	8.7	9.0	8.9	4.4	4.8	4.6
6	10.9	12.5	11.7	8.9	9.2	9.1	4.1	4.5	4.4
7	8.9	14.2	11.8	9.2	9.7	9.4	4.1	4.4	4.2
8	10.4	14.8	11.7	9.2	9.8	9.5	4.2	4.7	4.5
9	9.2	16.8	11.8	8.8	9.2	9.0	4.8	5.5	5.1
10	9.1	17.0	12.0	8.2	8.9	8.5	5.5	6.1	5.8
11	9.5	17.6	12.2	7.8	8.5	8.1	5.7	6.1	5.9
12	12.0	16.4	14.8	7.9	8.2	8.1	5.6	5.9	5.7
13	6.4	16.3	11.7	8.2	8.9	8.4	5.9	6.1	6.0
14	6.0	14.8	8.8	8.6	8.9	8.8	6.0	6.7	6.3
15				8.9	9.3	9.0	6.6	6.7	6.7
16				9.2	9.6	9.5	6.0	6.6	6.3
17				8.9	9.6	9.3	5.6	6.1	5.8
18	7.8	15.8	11.1	8.8	9.0	8.9	5.5	5.7	5.6
19	8.1	15.3	11.9	8.5	9.0	8.8	5.3	5.6	5.5
20	9.8	14.6	12.2	8.2	8.9	8.4	4.8	5.7	5.2
21	11.7	12.6	12.2	6.7	8.3	7.7	4.7	5.7	5.1
22	11.1	12.5	11.7	6.3	6.8	6.6	5.5	6.0	5.7
23	11.8	12.3	12.1	6.8	7.5	7.1	6.0	6.4	6.2
24	11.4	12.3	11.8	6.8	7.5	7.2	6.4	6.8	6.7
25	10.9	11.8	11.3	5.9	6.8	6.3	6.3	6.8	6.5
26	10.7	11.2	11.0	5.3	6.0	5.6	5.8	6.4	6.1
27	10.5	11.2	10.7	5.4	5.7	5.6	5.8	6.0	5.9
28	10.0	10.5	10.3	5.7	6.7	6.2	6.0	6.7	6.3
29	9.4	9.9	9.6	6.7	7.1	6.9	5.6	6.7	6.3
30	9.2	9.6	9.4	6.8	7.3	7.0	5.3	6.0	5.6
31	9.3	9.8	9.5				5.0	5.5	5.2
Total	6.0	17.6	11.5	5.3	10.3	8.2	4.1	6.9	5.8

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Appendix c. Liberation and survival information for summer steelhead released in the Umatilla Ri.

Brood	CWT Code	CWT Released	Total Released	Estimated Recaptures		Year Recovered	Age at Recovery	Oregon			Canada Net & Seine
				Number	%			Col.Ft. Gillnet	Col. R. Sport	Umatilla River	
87	073859	9829	10107	20	0.20	89	2	6		14	
				27	0.27	90	3	6		21	
				Total	47	0.48					
87	073860	9721	10075	30	0.31	89	2	14		16	
				42	0.43	90	3	21		21	
				Totals	72	0.74					
87	073861	9925	10267	31	0.31	89	2	10		21	
				32	0.32	90	3	12	3 /1	17	
				Totals	63	0.63					
a7	073856	9689	10423	31	0.32	89	2		11 /2	20	
				34	0.35	90	3	13		19	2
				Totals	65	0.67					
87	073857	9455	10171	26	0.27	89	2	7		19	
				11	0.12	90	3			11	
				1	0.01	91	4			1	
				Totals	38	0.40					
07	073856	9448	10163	7	0.07	89	2			7	
				19	0.20	90	3		3 /1	16	
				Totals	26	0.26					
88	074720	6764	9949	0	0.00	90	2				
				4	0.05	91	3		3	1	
				Totals	4	0.05					
88	074723	6789	9954	0	0.00	90	2				
				1	0.01	91	3			1	
				Totals	1	0.01					
88	074724	8784	9949	0	0.00	90	2				
				3	0.03	91	3			3	
				Totals	3	0.03					
88	074715	8800	9673	1	0.01	90	2			1	
				5	0.06	91	3			5	
				Totals	6	0.07					
88	074717	0791	9664	1	0.01	90	2			1	
				5	0.06	91	3			5	
				Totals	6	0.07					
88	074718	8778	9849	0	0.00	90	2				
				1	0.01	91	3			1	
				Total	1	0.01					
89	075212	9331	10239	40	0.43	91	2	5	9	26	
				5	0.05	92	3	5			
				Totals	45	0.48					

Appendix C (cont.)

Brood	CWT Code	C WT Released	Total Released	Estimated Recoveries		Year Recovered	Age at Recovery	Oregon			Canada Net & Seine
				Number	%			Col. R. Gillnet	Col. R. Sport	Umatilla River	
09	075213	9133	10022	30	0.42	91	2	5	2 /1	31	
				1	0.01	92	3	1			
				Totals	39	0.43					
09	075214	9000	9964	33	0.30	91	2	7	6 /1	20	
				25	0.28	92	3	25			
				Totals	50	0.64					
09	0752 15	9511	9830	43	0.45	91	2	9	5 /1	29	
				10	0.11	92	3	8	2 /1		
				Totals	53	0.56					
09	075216	9525	9845	36	0.30	91	2	5	2 /1	29	
				12	0.13	92	3	10	2 /1		
				Totals	48	0.50					
09	0752 17	9454	9771	45	0.46	91	2		25 /3	20	
				13	0.14	92	3	13			
				Totals	50	0.61					
90	075340	9035	10066	15	0.16	92	2	8	7		
90	07534 1	9019	10070	6	0.06	92	2	2	4 /1		
90	075342	9614	10065	11	0.12	92	2	4	7		
90	075343	9432	9754	14	0.15	92	2	10	4 /4		
90	075344	9467	9790	4	0.04	92	2	3	1		
90	075345	9450	9761	12	0.13	92	2	12			

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ii Caught at mouth of Deschutes River.
 12 Three caught at mouth of Deschutes River. Eight caught in Columbia River.
 /3 Two caught at mouth of Deschutes River. Twenty-three caught in Columbia River.
 /4 Three caught at mouth of Deschutes River. One caught in Columbia River.

Appendix D. Liberation and survival information for fall chinook salmon released in the Umatilla River. /1

Br Yr	CWT Code	C WT Rel	Total Rel	Estimated Recoveries		Year Rec.	Age	Oregon									
				No.	%			Ocean			Freshwater				Treaty Subsis	Spawn Ground	
								Com	Trawl	Sgt	Col. R Gillnet	Test Net Fishery	Sgt	Hatch			Trap
81	050851	46707	506279	19	0.04	83	2				2	10					
				179	0.38	a4	3	10			70				2		
				20	0.04	65	4				16						
				Totals	216	0.47											
61	051057	102331	672057	54	0.05	83	2					8					
				458	0.45	84	3	28	1		161		3		9		
				50	0.05	85	4				39		1				
				6	0.01	86	5				5						
Totals	568	0.56															
61	072663	102386	2626635	41	0.04	63	2					2					
				358	0.35	64		14			121		3		7		
				63	0.06	85	3				52			1			
				9	0.01	86	5										
Totals	471	0.46															
81	072741	99670	100564	7	0.01	63	2					4					
				15	0.02	84	3				11			3		1	
				103	0.10	85	4	2			27		1	1	1		
				40	0.04	86	5				27				1		
Totals	165	0.17															
82	072829	96448	175104 228412	12	0.01	85											
				54	0.06	a6	3	3			15						
				5	0.01	67	5										
				-	0.00	66	6				4						
Totals	75	0.08															
63	073124	210441	667190 996250	2	0.00	64	1										2
				80	0.04	85	2				16						
				492	0.23	66	3	16			204						
				871	0.41	07	4	2			416		1	3			
192	0.09	88	5				115			1							
1	0.00	89	6														
Totals	1638	0.78															
83	073127	88306	198162	26	0.03	65	2					13					
				110	0.12	66	3	4			26			1			
				478	0.54	67	4	47			185		6		1		
				62	0.09	88	5	4			31						
0	0.00	a9	6														
Totals	698	0.79															
84	073326	206756	3223172	29	0.01	86	2					13					2
				358	0.17	87	3	12			129						
				848	0.41	66	4	9			511		2				
				536	0.26	89	5	6			239		2		1		
23	0.01	so	6				7										
Totals	1794	0.87															
84	073162	30838	51000	18	0.06	87						4					
				63	0.27	88	3			36							
				96	0.32	89	5	6			56			2			
				7	0.02	90	6				7						
Totals	206	0.67															

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Appendix 0 (cont)

C WT Code	Year Rec	Washington									Calif Ocean		Canada Ocean Net & Seine			Alaska Ocean		FWS Freshwater	
		Ocean			Freshwater			I	Com	Spt	Corn.	Seine	Spt.	Com	Spt.	Hatch	Trap		
		Com	Spt	Net & Seine	Treaty Troll	Spt.	Hatch											Trap	Ground
050651	83		7																
	84	6			4	3					77	3	4						
	85										4								
051057	83		32	2							6		6					1	
	84	24	17	2		12					197		3						
	85		6								4								
	86																	1	
072663	83		21	1							7		10						
	84	I 14	11		5	6	2				170	4						1	
	85	I 2					2				4								
	86	I	6							3									
072741	83																		
	84															2			
	85				20		2				32		3		12				
	86										11				1				
072829	95	I	7																
	86	I 4	2				1				19	2		6					
	87	I					2				3		4						
	88	I																	
073124	84																		
	85					5	8					2		5					
	86		4	6			8				149	5	4	1	9	1			
	87		2	2	2		18	1			142	6			88				
	88		2				6				28	3			36	1			
	89	I					1												
073127	85							15											
	a6	I 5	4				8				37	19	4		2				
	97	I 6	23		2	8	17				165				12				
	88				6		7				9	23	2						
	89																		
073326	86											14							
	87		3			22	2			5	127	6	4		26	1			
	88		21		2		5				57	5	5		79	2			
	89		7			8	5				68	5			125				
	90										13				3				
C73162	87											9	4			1			
	88				2		3				30		4		6				
	99						7				20	2			3				
	90	I																	

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Appendix D (cont)

C WT Code	Year Rec.	Washington										Calif. Ocean		Canada Ocean			Alaska Ocean		FWS Freshwater	
		Ocean					Freshwater					Corn.	Spt.	Ocean			Hatch	Trap		
		Com	Spt	Net & Seine	Treaty Troll	Spt.	Hatch	Trap	Ground	Spawn	I			Com	Seine	Spt			Com	Spt.
073327	86							3	8				5	9		1				
	87		22	2	10	18	8						25	68	35	9	2			
	88	89	26	1	69	24	17		21				680	1	8	49	1			
	89	12	9			14	20		35				192	4	8	49				
	90												11		4	31				
	91						1													
073633	87	I														2				
	88	I			2				21				4	5						
	89	I					3						17			5				
	90	I					2					I	5			5				
	91	I							1											
073634	88	I					1								4					
	89	I			1								2			2				
	90	I											6			2				
	91	I																		
073835	87	I						4												
	88	I						3								2				
	89	I						2					4							
	90	I		8									3			10				
	91	I											4							
073636	88	I						4					12			2				
	89	I					4		17				3	2		5				
	90	I																		
	91	I																		
073637	87	I												5						
	88	I							21				5							
	89	I						3					8							
	90	I							17				3			6				
	91	I						1												
073638	87	I													2					
	88	I						5							2					
	89	I						3					4			15				
	90	I						1					11							
	91	I																		
073639	87	I																		
	88	I											3							
	89	I											10			5				
	90	I				1		3					4							
	91	I											3							
073840	87	I																		
	88	I						2					8							
	89	I						5					36			2				
	90	I						2								10				
	91	I																		

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Appendix D (cont)

CWT Code	Year Rec.	Washington							Calif Ocean Corn. Spt	Canada ocean Net & Seine Spt.			Alaska Ocean Com. Spt		FWS Freshwater Hatch Trap	
		Ocean				Freshwater				Com.	Seine	Spt.	Com.	Spt	Hatch	Trap
		Com	Spt	Net & Seine	Troll	Spt.	Hatch	Trap								
073830	a 7					3					6					
	88									6	6			4		4
	a9	5	2			15	4			28		4		6		6
	90						4			18				27		
	91						1			3						
073831	88					5					8					
	89	7	5			1	5			30		8		8	1	
	90						7			21				10		
	91															
073832	07															
	88		5		7											
	89					4	1			19	2	12		6		
	90						2			23	6			24		
	91									4				1		
073912	88						1					3				
	89		2		1		17		1	24				2		
	90		4			3	8		1	38				33		
	91						5			a	3				1	
	92															
073913	88						2					3		4		
	a9		1		1	6	9			28	6	4		8	1	
	90	2					9		2	47	3			22		
	91	2					3			4		4		16		
	92															
073914	88						2					3				
	89				5		13			5	32			1		
	90				2	11	13		1	51	2			u	1	
	91									11				7		
	92															
073915	90															
	91															
	92															
073916	90															
	91															
	92															
074035	a9						1									
	90															
	91															
074038	88															
	89		5	6	9	6				3	23	8		4		
	90	23	20		20	10	6			301	7			61	1	
	91	1					14		1	43				24		
	92								1							

Appendix D (cont.)

C WT Code	Year Rec.	Washington								Calif. Ocean		Canada Ocean Net & Seine			Alaska Ocean		FWS Freshwater	
		Ocean				Freshwater				Com	Spt	Com	Seine	Spt.	Com	Spt	Hatch	Trap
		Com	Spt	Net & Seine	Treaty Troll	Spt	Hatch	Trap	Spawn Ground									
074039	88																	
	89		2	2	11						6	26		5				
	90	14	21		23	16					228	10		83				
	91	2	2						1	2	37		4	23				
	92																	
074036	88																	
	89		23		6	5						22	11	2	1			
	90	15	27		6	6				4	201	3		45				
	91										42			16				
	92																	
071037	88																	
	89		4		1	12					4	15		1				
	90	4	22		9	1				4	210	3	3	52				
	91	2	5						1		32	3		19				
	92																	
375307	89																	
	90		2									6		a				
	91										16	3						
	92								1		17			17				
074539	90																	
	91											1						
	92										11							
074540	90				1													
	91																	
	92										3							
074541	90																	
	91																	
	92										6			2				
074536	89																	
	90																	
	91					2							12	1	1			
	92					4			2		10			6				
074537	89																	
	90	9								2		2		22				
	91		3									6						
	92								1		2							
074538	89																	
	90	6			3													
	91				3	7			2		15			7				
	92		a															

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Appendix D (cont)

C WT code	Year Rec	Washington								Calif Ocean Com Spt	Canada Ocean Net & Spt	I I	Alaska Ocean Com Spt	FWS Freshwater	
		Ocean				Freshwater								Hatch	Trap
		Corn.	Spt	Net & Seine	Treaty Troll	Spt	Hatch	Trap	Spawn Ground						
074758	90 91 92								3						
074760	90 91 92					2		2							
074763	90 91 92							1 1					1		
374753	90 91 92							2 2					2		
074754	90 91 92					2		1							
074757	90 91 92							3					4		
074646	90 91 92	I						2 5	1				1		
074647	90 91 92							4 5	2		3		1 4		
074648	90 91 92							6 5	1 2				3		
075403	91 92							3	1						
075404	91 92					2		4	3		3				
075405	91 92							3	1						
075325	91 92												4		

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Appendix D (cont.)

Br Yr	CWT Code	CWT Rel	Total Rel	Estimated Recoveries		Year Rec.	Age	Oregon											
				NC.	%			Ocean			Freshwater				Treaty Subsis	Spawn Ground			
								Com	Trawl	Spt	Col R. Gillnet	Test Nat. Fishery	Spt	Hatch			Trap		
69	075326	21929	23724	2	001	91	2												
				1	000			92	3										
				Totals	3			001											
69	075327	21101	22828	1	000	91	2												
				4	002			92	3										
				Totals	5			002											
89	075322	23413	25472	0	000	91	2												
				2	001			92	3										
				Totals	2			001											
89	075323	23617	25694	0	000	91	2												
				1	000			92	3										
				TOWS	1			000											
89	075324	23420	25460	0	000	91	2												
				2	001			92	3										
				Totals	2			001											
90	075225	52225	53664	1	000	92	2												
90	075226	51728	53595	0	000	92	2												
90	075328	48268	50442	2	000	92	2												2
90	075449	46461	50101	7	001	92	2							3					2
90	070016	48301	49732	1	000	92	2												
90	075450	51614	52326	1	000	92	2												
90	075451	52444	52706	4	001	92	2												1
90	075563	26173	26461	0	000	92	2												
90	075601	24762	26585	0	000	92	2												
90	075602	25476	26608	1	000	92	2												
90	075560	25720	25862	7	003	92	2							6					
90	075561	25425	25706	0	000	92	2												
90	075562	22309	23295	1	000	92	2												

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†1 The adult returns from the 1986-90 brood are incomplete.

Appendix D (cont ,

CWT Code	Year Rec	Washington									Calif. Ocean		Canada Ocean Net & Seine			Alaska Ocean		Fws Freshwater	
		Ocean				Freshwater					Corn.	Spt.	Com.	Seine	Spt.	Com	Spt.	Hatch	Trap
		Com	Spt	Net & Seine	Treaty Troll	Spt	Hatch	Trap	Spawn Ground										
075326	91 92													2					
075327	91 92																		
075322	91 92								2										
075323	91 92								1										
075324	91 92																		
075225	92								1										
075226	92																		
075326	92																		
075449	92								2										
070016	9 2								1										
375450	92																		
375451	92								3										
075563	92																		
075601	9 2																		
375602	92																		
075660	9 2																		
075661	92																		
075662	92																		

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Appendix E. Liberation and survival information for spring chinook salmon released in the Umatilla River.

Brood	CWT Code	CWT Released	Total Released	Estimated Recoveries		Year Recov.	Age at Recov.	Oregon				
				Number	%			Hatch.	Col. R Sport	Col. R. Gillnet		
86	074325	26640	35946	3	0.011	88	2	2				
				4	0.015	89	3					
				137	0.514	90	4				1	2
				26	0.098	91	5					
				Totals	170	0.638						
86	074326	25863	35148	0	0.000	88	2					
				2	0.008	89	3					
				185	0.715	90	4				26	3
				62	0.240	91	5					
				Totals	249	0.963						
86	074327	25853	35137	0	0.000	88	2					
				2	0.008	89	3					
				118	0.456	90	4					
				43	0.166	91	5					
				Totals	163	0.630						
86	074328	26319	34187	1	0.004	88	2	1				
				3	0.011	89	3					
				91	0.346	90	4				2	
				44	0.167	91	5					
				Totals	139	0.528						
86	074329	25722	33573	2	0.008	88	2	2				
				2	0.008	89	3					
				146	0.568	90	4				1	
				45	0.175	91	5					
				Totals	195	0.758						
86	074330	26252	34118	0	0.000	88	2					
				0	0.000	89	3					
				160	0.609	90	4				1	
				70	0.267	91	5					
				Totals	230	0.876						
87	074420	416	410	0	0.000	89	2					
				0	0.000	90	3					
				0	0.000	91	4					
				Totals	0	0.000						
87	074423	399	393	0	0.000	89	2					
				0	0.000	90	3					
				3	0.752	91	4					
				Totals	3	0.752						

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Appendix E (cont)

CWT Code	Year Recov.	Oregon				Wash.		
		Test Net Fishery /1	Indian Ceremonial /1	Umatilla R. Fish Trap	Umatilla R. Spawn Surveys	Hatch.	Sport	Treaty Troll
074325	88					1		
	89			4				
	90		11	108	15			
	91		6	5	13			
074326	88							
	89			2				
	90		12	132	9		3	
	91		8	27	7			
074327	88							
	89			2				
	90		17	74	12	7		
	91		6	22	14			
074328	88							
	89			3				
	90		11	66	11			
	91		6	32	5			
074329	88							
	89			2				
	90		15	125	5			
	91		9	27	3			
074330	88							
	89							
	90		11	132	14			
	91		11	38	8			
0744x	89							
	90							
	91							
074423	89							
	90							
	91			3				

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Appendix E (cont)

Brood	CWT Code	CWT Released	Total Released	Estimated Recoveries		Year Recov.	Age at Recov.	Oregon			
				Number	%			Hatch.	Col. R. Sport	Col. R. Gillnet	
87	074424	381	376	0	0.000	89	2				
				0	0.000	90	3				
				3	0.787	91	4				
				Totals		3	0.787				
87	074427	26109	25987	0	0.000	89	2				
				0	0.000	90	3				
				21	0.080	91	4				
				Totals		21	0.080				
87	074429	24183	24070	0	0.000	89	2				
				2	0.008	90	3				
				19	0.079	91	4				
				1	0.004	92	5				
				Totals		22	0.091				
87	074430	25475	25356	0	0.000	89	2				
				0	0.000	90	3				
				25	0.098	91	4				
				1	0.004	92	5				
				Totals		26	0.102				
87	074433	25427	26135	0	0.000	89	2				
				4	0.016	90	3				
				72	0.283	91	4				
				0	0.000	92	5				
				Totals		76	0.299				
87	074434	27004	27756	0	0.000	89	2				
				2	0.007	90	3				
				73	0.270	91	4				
				4	0.015	92	5				
				Totals		79	0.293				
87	074436	25386	26093	0	0.000	89	2				
				3	0.012	90	3				
				54	0.213	91	4				
				4	0.016	92	5				
				Totals		61	0.240				
87	074439	27585	28153	1	0.004	89	2	1			
				0	0.000	90	3				
				79	0.286	91	4				
				13	0.047	92	5				
				Totals		93	0.337				

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Appendix E (cont.)

CWT Code	Year Recov.	Oregon				Wash.		
		Test Net Fishery /1	Indian Ceremonial /1	Umatilla R. Fish Trap	Umatilla R. Spawn Surveys	Hatch.	Sport	Treaty Troll
074424	89 90 91			3				
074427	89 90 91			19	2			
074429	89 90 91 92		3	2 13	3 1			
074430	89 90 91 92			2 1	3			
074433	89 90 91 92		11	4 48	13			
074434	89 90 91 92			2 58 3	6 1			
074436	89 90 91 92		11 2	3 35 1	7 1			
074439	89 90 91 92		10 2	58	10			

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Appendix E (cont)

Brood	CWT Code	CWT Released	Total Released	Estimated Recoveries		Year Recov.	Age at Recov.	Oregon		
				Number	%			Hatch.	Col. R. Sport	Col. R. Gillnet
87	074440	27550	28116	0	0.000	89	2			
				3	0.011	90	3			
				98	0.356	91	4			
				4	0.015	92	5			
				Totals	105	0.381				
87	074443	24165	24663	2	0.008	89	2	2		
				2	0.008	90	3			
				71	0.294	91	4			
				3	0.012	92	5			
				Totals	78	0.323				
88	075063	24801	24968	2	0.008	91	3	1		
				6	0.024	92	4			
				Totals	8	0.032				
88	075101	28109	28299	0	0.000	91	3			
				5	0.018	92	4			
				Totals	5	0.018				
88	075102	27299	27483	2	0.007	91	3			
				10	0.037	92	4			
				Totals	12	0.050				
88	075103	27137	27287	2	0.007	91	3			
				6	0.022	92	4			
				Totals	8	0.029				
88	075104	28560	28718	4	0.014	91	3			5
				16	0.056	92	4			
				Totals	20	0.070				
88	075105	27695	27848	1	0.004	91	3			
				4	0.014	92	4			
				Totals	5	0.018				
88	075106	26638	38224	2	0.008	91	3			3
				49	0.184	92	4			
				Totals	51	0.191				
88	075107	26160	37538	1	0.004	91	3			11
				58	0.222	92	4			
				Totals	59	0.226				
88	075108	26888	38583	0	0.000	91	3			12
				45	0.167	92	4			
				Totals	45	0.167				

Appendix E (cont)

CWT Code	Year Recov	Test Net Fishery /1	Oregon			Umatilla R.		Wash.		
			Indian Ceremonial /1	Umatilla R. Fish Trap	Umatilla R. Spawn	Umatilla R. Surveys	Hatch.	Sport	Treaty Troll	
074440	89									
	90				2		1			
	91	1	11	76		10				
	92		2	1					1	
074443	89									
	90				2					
	91	2	11	48		10				
	92			2		1				
075063	91				1					
	92				2			1		
075101	91									
	92				4		1			
075102	91				2					
	92				6					
075103	91				2					
	92				6					
075104	91				4					
	92				4					
075105	91				1					
	92				4					
075106	91				2					
	92	1	13	27		5				
075107	91				1					
	92		18	21		7		1		
075108	91									
	92		7	23		2		1		

Appendix E (cont)

Brood	CWT Code	CWT Released	Total Released	Estimated Recoveries		Year Recov.	Age at Recov.	Hatch.	Oregon Col. R. Sport	Col. R. Gillnet
				Number	%					
88	075109	25611	39012	2	0.008	91	3			14
				54	0.211					
				Totals	56					
88	075110	26307	40072	5	0.019	91	3			7
				62	0.236					
				Totals	67					
88	075111	25172	38343	3	0.012	91	3			3
				40	0.159					
				Totals	43					
89	075115	25921	33440	2	0.008	92	3			

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/1 Columbia River

Appendix E (cont)

CWT Code	Year Recov	Oregon				Wash.		
		Test Net Fishery /1	Indian Ceremonial /1	Umatilla R. Fish Trap	Umatilla R Spawn Surveys	Hatch.	Sport	Treaty Troll
075109	91			2				
	92		7	30	3			
075110	92	2	22	23	6	1		
075111	91			3				
	92	1	11	21	2	2		
075115	92			2				

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Appendix F. Liberation and survival information for coho salmon released in the Umatilla River/1

Brood	CWT Code	CWT Released	Total Released	Estimated Recoveries		Year Recov.	Age	Oregon						
				No	%			Ocean		Freshwater				
								Comm	Sport	Col.R. Gillnet	Test Net Fiskry	Sport	Hatch	Uma R
65	073617	13440	37245	1 249	0.01 1 %	87 88	2 3	83	20	77	1	4	1 2	13
			Total	250	1 %									
a5	373624	19879	53754	0 313	0.00 1.57	a7 88	2 3	96	52	62		8	6	9
			Total	313	1.57									
05	073625	26740	70690	0 396	0.00 1.49	67 88	2 3	158	49	99		5	5	10
			Total	396	1.49									
66	0743%	20592	68208	38 843	0.18 4.09	88 89	2 3	202	1%	16 171			a	22 93
			Total	881	4.28									
66	074357	18963	73651	25 745	0.13 3.93	88 a9	2 3	207	116	128		3	4.2	25 109
			Total	770	4.06									
86	074358	18513	61636	22 734	0.12 3 %	88 89	2 3	189	129	117	1	6	8	22 108
			Total	756	4.08									
a7	374609	27062	75973	7 142	0.03 0.52	89 90	2 3	32	24	2		32	4	7 7
			Total	149	0.55									
a7	074610	26416	72627	13 253	0.05 0 %	a9 90	2 3	23	68	24	1		a	13 16
			Total	266	1.01									
87	074611	26739	04672	17 261	0.06 0 %	a9 90	2 3	55	2 35	16			12	15 15
			Total	278	1.04									
88	074614	28033	67309	34 809	0.12 2.89	so 91	2 3	127	3 a5	4 238	2	37	6 41	15 5s
			Total	843	3.01									
88	074613	26881	59682	45 781	0.17 2.91	so 91	2 3	104	130	16 192		1 48	5 31	22 41
			Total	826	3.07									
88	074615	27226	65095	39 1039	0.14 3.82	90 91	2 3	162	146	2 216	3	99	a 69	25 5s
			Total	1076	3 %									
89	075535	24584	152974	3 59	0.01 0.24	91 92	2 3		16	19				3 1
			Total	62	0.23									
a9	075534	25905	449676	6 37	0.02 0.14	91 92	2 3		13	15		4	1	5 1
			Total	43	0.16									

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Appendix F. (cont.)

CWT Code	Year Recov.	Washington							California Ocean		Canada Ocean			FWS
		Ocean		Net & Seine	Treaty Troll	F w			Comm.	Spt.	Comm.	Spt.	Net & Seine	Hatch
		Comm.	Spt.			Buoy 10	Hatch.	Spt.						
073617	87 88		6			27			4	7	5			
073624	87 88		5			15			13	17	10			
073625	87 88					27	1	10	10	7	16			1
074356	88 89	11	52	4	10	56	1	3	20	30	37	4	10	
074357	88 89	6	44		16	57			8	12	31	4		
074356	88 89	19	52		22	30		1	11	17	11		7	1
074609	89 90		4			6			19	12				
074610	89 90	2	33		3	11			35	21	6			
074611	89 90	37	29		3	6			26	16	7			
074814	90 91					3 103			14	48			3	1
074613	90 91	10	24			1 117			32	34	18			
074615	90 91	18	2 34			127			49	49	7		2	1
075535	91 92	2	21											
075534	91 92		4											

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Appendix F. (Cont)

Brood	CWT Code	CWT Released	Total Released	Estimated Recoveries		Year Recov.	Age	Oregon							
				No.	%			Ocean		Freshwater					
								Comm.	Spat	Col. R. Gillnet	Test Net Fishery	Sport	Hatch	Uma R.	
89	075533	24651	352677	2	0.01	91	2	3	6	7	1			2	
				35	0.14	92								3	6
			Total	37	0.14										
90	075620	27906	472221	2	0.01	92	2								2
90	075621	27705	244615	0	0.00	92	2								
90	075622	27456	244550	3	0.01	92	2								3

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- /1 Survival data for the 1990 brood includes age-2 fish only (1992 returns).
- /2 Includes one fish recovered on spawn ground survey in Salmon River.
- /3 Includes one fish recovered on spawn ground survey in Big White Salmon River

Appendix F. (cont)

CWT Code	Year Recov	Washington							California Ocean		Canada Ocean			FWS
		Ocean			Treaty Troll	Fw			Comm	Spt.	Comm.	Spt.	Net & Seine	Hatch.
		Comm.	Spt.	Net & Seine		Buoy 10	Hatch.	Spt.						
075533	91 92			10										
075620	92													
075621	92													
075622	92													

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Appendix G. Umatilla River summer steelhead broodstock collection in 1991 – 92.

Date Collected	Opercle Mark	Ad LV		Total Ad LV	Unmarked		Total Unmarked	Total		Total
		Male	Female		Male	Female		Male	Female	
10-18	3LOP	1	0	1	0	1	1	1	1	2
10-21	3LOP	2	0	2	4	2	6	6	2	8
10-23	3LOP	2	5	7	0	2	2	2	7	9
10-25	3LOP	2	2	4	1	1	2	3	3	6
10-30	3LOP	1	2	3	0	0	0	1	2	3
11-6	3ROP	1	2	3	2	0	2	3	2	5
11-8	3ROP	0	4	4	1	3	4	1	7	8
11-11	3ROP	7	3	10	0	0	0	7	3	10
11-13	3ROP	1	2	3	0	0	0	1	2	3
11-18	3ROP	2	2	4	0	0	0	2	2	4
11-20	3ROP	0	0	0	4	4	8	4	4	8
11-22	3ROP	3	2	5	0	0	0	3	2	5
11-24	3ROP	10	11	21	0	0	0	10	11	21
11-25	3ROP	6	1	7	10	16	26	16	17	33
12-4	2LOP	2	2	4	6	6	12	8	8	16
12-9	2LOP	6	5	11	1	2	3	7	7	14
12-11	2LOP	0	0	0	3	3	6	3	3	6
12-13	2LOP	0	0	0	9	12	21	9	12	21
12-16	2LOP	1	0	1	3	2	5	4	2	6
12-26	2LOP	2	3	5	5	5	10	7	8	15
12-27	2LOP	0	0	0	2	2	4	2	2	4
1-16	1ROP	0	0	0	1	2	3	1	2	3
1-28	1ROP	0	0	0	2	2	4	2	2	4
1-31	1ROP	0	0	0	2	2	4	2	2	4
2-4	2ROP	0	0	0	1	1	2	1	1	2
2-14	2ROP	0	0	0	2	1	3	2	1	3
2-18	2ROP	0	0	0	1	2	3	1	2	3
2-24	2ROP	0	0	0	4	4	8	4	4	8
2-27	2ROP	0	0	0	1	1	2	1	1	2
2-28	2ROP	0	0	0	3	3	6	3	3	6
3-2	1LOP	0	0	0	3	3	6	3	3	6
3-6	1LOP	0	0	0	3	3	6	3	3	6
3-9	1LOP	0	0	0	12	10	22	12	10	22
3-16	1LOP	0	0	0	3	3	6	3	3	6
3-17	1LOP	0	0	0	4	5	9	4	5	9
3-31	1LOP	0	0	0	1	0	1	1	0	1
4-14	None	0	0	0	9	9	18	9	9	18
4-16	None	0	0	0	5	5	10	5	5	10
4-17	None	0	0	0	3	3	6	3	3	6
4-22	None	0	0	0	1	1	2	1	1	2
4-24	None	0	0	0	2	2	4	2	2	4
Totals		49	46	95	114	123	237	163	169	332

Revised: 12/7/92

File Name: C:\123R3\DATA\92BRCOL2

Appendix H. Steelhead broodstock spawning at Minthorn Acclimation Facility in 1992

Date Spawned	Fish No.	Sex	Family No.	Fork Length	Hypural Length	Opercle Mark /1	Month Collected	Scale No.	Green Eggs	Eyed Eggs
3/1 9192	1	F	1	610	520	1ROP	Jan.	11		
	2	F	1	680	565	1ROP	Jan.	12		
	3	F	1	650	530	2LOP	Dec.	13		
	4	M	1	640	530	2LOP	Dec.	14		
	5	M	1	705	565	1ROP	Jan.	15		
	6	M	1	040	515	2LO P	Dec.	16		
	7	F	2	720	595	2LO P	Dec.	17		
	8	F	2	690	500	2LO P	Dec.	10		
	9	F	2	745	615	2LOP	Dec.	19		
	10	M	2	000	495	2LO P	Dec.	20		
	11	M	2	605	490	2LOP	Dec.	-		
	12	M	2	630	520	1LOP	Mar.	-		
	13	F	3	000	570	2 ROP	Feb.	-		
	14	F	3	675	550	2LOP	Dec.	-		
	15	M	3	040	520	2 ROP	Feb.	-		
	16	M	3	610	490	3 ROP	N w.	-		
									45,924	31,399
3/26/92	17	F	4	575	485	3LOP	Oct.	4		
	18	F	4	585	500	2LOP	Dec.	5		
	19	M	4	640	525	2LO P	Dec.	6		
	20	M	4	575	465	3LOP	Oct.	7		
									0,577	6,960
4/7/92	21	F	5	635	530	2LO P	Dec.	1		
	22	F	5	695	575	2LO P	Dec.	2		
	23	F	5	710	595	2LOP	Dec.	3		
	24	M	5	650	530	2LOP	Dec.	4		
	25	M	5	630	510	2LO P	Dec.	5		
	26	M	5	600	460	2LO P	Dec.	-		
	27	F	6	000	575	3 ROP	N w.	6		
	28	F	6	610	515	2LO P	Dec.	7		
	29	F	6	640	530	2 ROP	Feb.	0		
	30	M	6	690	550	2LO P	Dec.	9		
	31	M	6	610	490	2 ROP	Feb.	10		
	32	M	6	710	580	3 ROP	N w.	-		
	33	M	Green	592	460	3ROP	N w.	-		
									31,062	30246
4/14/92	34	F	7	710	500	2LO P	Dec.	1		
	35	F	7	605	495	3 ROP	N w.	2		
	36	F	7	640	525	2LO P	Dec.	3		
	37	M	7	765	625	2LOP	Dec.	4		
	38	M	7	590	475	3ROP	N w.	5		
	39	M	7	640	515	2LO P	Dec.	6		
	40	F	0	705	580	1LOP	Mar.	7		
	41	F	0	705	655	2 ROP	Feb.	0		
	42	M	8	605	490	1LOP	Mar.	9		
	43	M	8	605	490	2 ROP	Feb.	10		
										37,407
4/21/92	44	F	9	660	555	None	Apr.	1		
	45	F	9	710	590	None	Apr.	2		
	46	F	9	715	590	None	Apr.	3		
	47	M	9	500	455	None	Apr.	4		
	48	M	9	665	525	None	Apr.	5		
	49	M	9	645	520	None	Apr.	6		
	50	F	10	000	500	2LO P	Dec.	7		

Appendix H. (Cont.)

Date Spawned	Fish No.	Sex	Family No.	Fork Length	Hypural Length	Opercle Mark /1	Month Collected	Scale No.	Green Eggs	Eyed Eggs
4/21/92 (Cont.)	51	F	10	550	450	2LOP	Dec.	0		
	52	F	10	630	520	2LOP	Dec.	9		
	53	M	10	645	535	2LOP	Dec.	10		
	54	M	10	625	500	2LOP	Dec.	11		
	55	M	10	575	460	2LOP	Dec.	12		
	56	F	11	740	605	2ROP	Feb.	13		
	57	F	11	-	440	2ROP	Feb.	14		
	58	F	11	620	515	2LOP	Dec.	15		
	59	M	11	625	510	2ROP	Feb.	16		
	60	M	11	615	495	2ROP	Feb.	17		
	61	M	11	705	555	2LOP	Dec.	10		
	62	F	12	720	595	1LOP	Mar.	19		
	63	F	12	660	540	1LOP	Mar.	20		
	64	F	12	750	610	1LOP	Mar.	--		
	65	M	12	590	475	1LOP	Mar.	--		
	66	M	12	690	570	1LOP	Mar.	--		
	67	M	12	610	495	1LOP	Mar.	--		
	68	F	13	595	485	3ROP	Nov.	--		
	69	F	13	620	510	3ROP	N w.	--		
	70	M	13	640	500	3ROP	Nov.	--		
	71	M	13	625	505	3ROP	N w.	--		
	72	M	Green	600	490	None	Apr.	--		
	73	F	Overripe	600	495	3ROP	Nov.	--		
									80.109	67.000
4/28/92	74	F	14	700	590	2LOP	Dec.	1		
	75	F	14	725	600	2LOP	Dec.	2		
	76	F	14	635	525	2LOP	Dec.	3		
	77	M	14	660	540	2LOP	Dec.	4		
	78	M	14	580	460	2LOP	Dec.	5		
	79	M	14	630	510	2LOP	Dec.	6		
	80	F	15	700	575	1ROP	Jan.	7		
	81	F	15	635	525	2ROP	Feb.	0		
	82	F	15	650	540	2LOP	Dec.	9		
	83	M	15	655	520	2ROP	Feb.	10		
	84	M	15	600	480	2LOP	Dec.	11		
	85	M	15	660	540	1LOP	Mar.	12		
	86	F	16	555	455	3ROP	Nov.	13		
	87	F	16	590	405	3ROP	Nov.	14		
	88	F	16	720	595	2LOP	Dec.	15		
	89	M	16	615	505	3LOP	Oct.	16		
	90	M	16	640	520	1ROP	Jan.	17		
	91	M	16	700	625	3ROP	Nov.	18		
	92	F	17	620	515	None	Apr.	19		
	93	F	17	560	485	None	Apr.	20		
	94	F	17	775	650	None	Apr.	--		
	95	M	17	600	490	None	Apr.	--		
	96	M	17	555	455	None	Apr.	--		
97	M	17	725	590	None	Apr.	--			
98	F	10	670	570	1LOP	Mar.	--			
99	F	10	500	485	1LOP	Mar.	--			
100	F	18	590	490	1LOP	Mar.	--			
101	M	10	590	480	1LOP	Mar.	--			
102	M	18	650	510	1LOP	Mar.	--			
103	M	18	660	515	1LOP	Mar.	--			
104	F	19	590	495	3ROP	N w.	--			
105	F	19	580	475	3ROP	N w.	--			
106	F	19	620	500	3LOP	Oct.	--			
107	M	19	705	565	3ROP	Nov.	--			
108	M	19	615	500	3ROP	N w.	--			
109	M	19	650	525	3LOP	Oct.	--			

Appendix H. (Cont.)

Date Spawnd	Fish No.	Sex	Family No.	Fork Length	Hypural Length	Opercle Mark /1	Month Collected	Scale No.	Green Eggs	Eyed Eggs
4/28/92 (Cont.)	110	F	20	620	515	2 ROP	Feb.	--		
	111	F	20	640	540	2 ROP	Feb.	--		
	112	F	20	630	525	2 ROP	Feb.	--		
	113	M	20	590	490	2 ROP	Feb.	--		
	114	M	20	635	520	2 ROP	Feb.	--		
	115	M	20	610	505	1LOP	Mar.	--		
	116	F	21	640	530	2RO P	Feb.	--		
	117	M	21	625	510	1LOP	Mar.	--		
	118	F	Bloody	560	460	None	Apr.	--		
	119	M	Green	580	460	None	Apr.	--		
									126.340	101,200
5/5/92	120	F	22	605	495	1LOP	Mar.	1		
	121	F	22	690	565	1LOP	Mar.	2		
	122	F	22	630	520	1LOP	Mar.	3		
	123	M	22	590	465	1LOP	Mar.	4		
	124	M	22	600	480	1LOP	Mar.	5		
	125	M	22	630	500	1LOP	Mar.	--		
	126	F	23	650	530	None	Apr.	6		
	127	F	23	615	505	None	Apr.	7		
	128	F	23	605	505	None	Apr.	8		
	129	M	23	695	590	None	Apr.	9		
	130	M	23	630	510	None	Apr.	10		
	131	M	23	715	580	1LOP	Mar.	11		
	132	F	24	615	495	2LO P	Dec.	13		
	133	F	24	--	545	2LO P	Dec.	14		
	134	F	24	580	470	2LO P	Dec.	15		
	135	M	24	655	515	2LO P	Dec.	16		
	136	M	24	690	535	2LO P	Dec.	17		
	137	M	24	590	475	2LO P	Dec.	18		
	138	F	25	650	540	None	Apr.	19		
	139	F	25	580	475	2LOP	Dec.	20		
140	F	25	765	635	None	Apr.	--			
141	M	25	640	515	1LOP	Mar.	--			
142	M	25	--	560	1LOP	Mar.	--			
143	M	25	720	590	1ROP	Jan.	--			
144	F	26	620	510	3LOP	Oct.	--			
145	F	26	580	475	2LO P	Dec.	--			
146	F	26	610	495	3 ROP	Nov.	--			
147	M	26	600	480	2 ROP	Feb.	--			
148	M	26	580	465	3LO P	Oct.	--			
149	M	26	655	525	3ROP	Nov.	--			
150	M	Green	560	450	None	Apr.	12			
									75.626	65.274
5/12/92	151	F	27	640	545	1LOP	Mar.	1		
	152	F	27	625	530	2 ROP	Feb.	2		
	153	F	27	710	625	1LOP	Mar.	3		
	154	M	27	615	515	1LOP	Mar.	4		
	155	M	27	670	550	None	Apr.	5		
	156	M	27	645	545	1LOP	Mar.	6		
	157	F	28	620	545	1LOP	Mar.	7		
	156	F	28	--	595	None	Apr.	8		
	159	F	28	--	500	None	Apr.	9		
	160	M	28	660	525	None	Apr.	10		
	161	M	28	635	565	None	Apr.	11		
	162	M	28	580	525	1LOP	Mar.	12		
	163	F	29	585	485	2LOP	Dec.	13		
	164	F	29	650	555	2LOP	Dec.	14		
	165	F	29	--	530	1ROP	Jan.	15		
	166	M	29	675	555	1ROP	Jan.	16		

Appendix H. (Cont.)

Date Spawned	Fish No.	Sex	Family No.	Fork Length	Hypural Length	Opercle Mrk /1	Month Collected	Scale No.	Green Eggs	Eyed Eggs	
5/12/92	167	M	29	680	550	2LOP	Dec.	17			
(Cont.)	168	M	29	680	560	None	Apr.	18			
	169	F	30	595	500	3ROP	N W.	19			
	170	F	30	600	515	3ROP	N W.	20			
	171	F	30	550	475	3ROP	Nov.	-			
	172	M	30	645	530	2LOP	Dec.	-			
	173	M	30	610	500	1ROP	Jan.	-			
	174	M	30	605	495	None	Apr.	-			
	175	F	31	-	555	3LOP	Oct.	-			
	176	F	31	-	535	3LOP	Apr.	-			
	177	M	31	620	515	None	Apr.	-			
	178	M	31	600	490	None	-	-			
	179	F	Green	690	595	2ROP	Feb.	-			
	180	M	Green	665	525	2LOP	Dec.	-			
									71,606	61,548	
									TOTAL	476.87	1 394.815
									FECUNDITY	5.545	

Revised- 7/9/92

File Name: 123R3\DATA\SPAWN92

/1 1 LOP = one left opercle hole punch 1ROP = one right opercle hole punch
 2LO P = two left opercle hole punches 2ROP = two right opercle hole punches.
 3LO P = three left opercle hole punches 3ROP = three right opercle hole punches.
 None = no opercle marks

Appendix I. Disposition of fell chinook salmon broodstock held at **Mirxhorn** Acclimation Facility in 1992.

Date	Fish No.	Disposition	Family No.	sex	Weight (gms)	Foh Ln (mm)	MEHP Ln (mm)	Fin Marks	Scale No.	Card Pos.	Green Eggs	Eyed Eggs
11/9/92	1	Spawned	1	F	5820	840	690	None	1	1		
	2		1	F	4655	730	590	.	1	2		
	3		1	F	6583	860	715	.	1	3		
	4		1	F	3975	730	590	.	1	4		
	5	.	1	M	5220	810	640	.	1	5		
	6	.	1	M	3180	670	530	.	1	6		
	7	.	1	M	6015	700	560	.	1	7		
	8	.	1	M	3520	860	685	.	1	8		
	9	.	2	F	5675	785	640	.	1	9		
	10	.	2	F	11010	985	825	Ad	1	10		
	11	.	2	F	4315	720	605	None	1	11		
	12	.	2	F	4995	760	625	.	1	12		
	13	.	2	M	5560	790	620	.	1	13		
	14	.	2	M	4655	750	595	.				
	15	.	2	M	6245	850	675	.				
	16	.		M	4200	715	575	.				
	17	.	3	F	6695	860	700	.				
	18	.	3	F	4880	775	625	.				
	19	.	3	F	4995	755	615	.		--		
	20	.	3	F	3460	660	550	.		--		
	21	.	3	M	4285	860	685	.		--		
	22	.	3	M	4315	720	585	.		--		
	23	.	3	M	4200	730	590	.		--		
	24	.	3	M	6925	740	606	.		--		
	25	.	4	F	4540	760	610	.				
	26	.	4	M	2610	615	515	.				
											45660	42032
11/12/92	27	Mortality		M	3160	668	555	None	2			
11/13/92	28	Spawned	5	F	4570	770	635	None	3			
	29	.	5	F	6290	805	650	.	3	2		
	30	.	5	F	6540	880	780	.	3	3		
	31	.	5	F	8980	910	745	.	3	4		
	32	.	5	M	7580	890	715	.	3	5		
	33	.	5	M	6530	870	680	.	3	6		
	34	.	5	M	4620	800	600	.	3	7		
	35	.	5	M	4080	760	610	.	3	8		
	36	.	6	F	6030	850	680	.	3	9		
	37	.	6	F	4220	725	585	.	3	10		
	38	.	6	F	5030	770	640	.	3	11		
	39	.	6	F	3690	720	590	.	3	12		
	40	.	6	M	3750	675	540	.	3	13		
	41	.	6	M	2940	725	570	.	3	14		
	42	.	6	M	6150	755	650	.	3	15		
	43	.	6	M	4360	825	660	.	3	18		
	44	.	7	F	6540	835	685	.	3	17		
	45	.	7	F	4760	765	620	.	3	18		
	46	.	7	F	13010	1040	860	.	3	19		
	47	.	7	F	6450	845	690	Ad	3	20		
	48	.	7	M	5430	755	580	None	4			
	49	.	7	M	5850	985	790	Ad	4	2		
	50	.	7	M	9130	850	670	Ad	4	3		
	51	.	7	M	4590	820	655	None	4	4		
	52	.	8	F	6650	850	675	.	4	5		
	53	.	8	F	4280	720	585	.	4	6		
	54	.	8	F	2140	580	465	.	4	7		
	55	.	8	M	9040	720	540	.	4	8		
	56	.	8	M	3830	740	590	.	4	9		
	57	.	8	M	3760	950	735	.	4	10		
	58	Bad eggs		F	3070	680	555	.				
											51339	49515
11/16/92	59	Mortality		M	1200	510	395	RV		--		

Revised: 12/4/92

FileFlame:C:\123R3\DATA\CHF92

Appendix I. (Cont.)

Date	Fish No.	Disposition	Family No.	Sex	Weight (gms)	Folk Ln. (mm)	MEHP In (mm)	Fin Marks	Scale No.	Card Pos.	Green Eggs	Eyed Eggs
11/16/92	60	Spawned	9	F	9710	990	810	Ad	5	1		
	61		9	F	5970	840	6 %	None	5	2		
	62		9	F	4460	770	615		5	3		
	63		9	F	4590	760	605		5	4		
	64		9	M	7030	860	675		5	5		
	65		9	M	6620	890	705		5	6		
	66		9	M	5570	800	635		5	7		
	67		9	M	5460	800	625		5	8		
	68		10	F	3350	700	565		5	9		
	69		10	F	5810	800	655		5	10		
	70		10	F	7540	870	695		5	11		
	71		10	M	1100	485	385	W	5	12		
	72		10	M	4950	790	605	Norm	5	13		
	73		10	M	11850	1050	015		5	14		
											24054	22272
11/19/92	74	Spawned	11	F	3600	700	570	None	6	1		
	75		11	F	11260	999	850	Ad	6	2		
	76		11	F	3820	711	5 %	None	6	3		
	77		11	F	11170	1011	845		6	4		
	79		11	M	5650	838	683		6	5		
	79		11	M	3680	-	572		6	6		
	80		11	M	6980	% 2	713		6	7		
	81		11	M	3290	683	562		6	8		
	82		12	F	4710	769	636		6	9		
	83		12	F	5280	796	672		6	10		
	94		12	F	4990	701	656		6	11		
	85		12	F	4100	726	611		6	12		
	86		12	M	4590	763	621					
	07		12	M	8630	955	784		6	13		
	88		12	M	7280	912	752	Ad	6	14		
	99		12	M	2880	671	549	None	6	15		
	90		13	F	3900	720	585		6	16		
	91		13	F	3670	775	584		6	17		
	92		13	F	4130	742	615		6	18		
	93		13	F	8260	890	725	Ad	6	19		
	94		13	M	2170	634	506	None	6	20		
	95		13	M	2470	665	535					
	96		13	M	3670	730	580					
	97		13	M	2360	627	500					
	98		14	F	5760	800	645	Ad				
	99		14	F	3780	705	573	None				
	100		14	F	6670	865	710					
	101		14	F	4520	768	620					
102		14	M	2660	652	515		-				
103		14	M	2690	660	530						
104		14	M	1820	5 %	475	w					
105		14	M	820	444	357	Ad					
106	Green		M	2520	-	523						
107	Green		M	3320	694	555	None					
											57138	53108
11/19/92	108	Mortality		M	7150	905	740	None				
	109			M	5220	-	725	Ad				
	110			M	2540	675	555	None				
	111		-	M	980	480	385	Ad				
	112			M	2530	638	525					
	113			M	2120	610	505	W				

Revised: 12/4/92

File Name: C:\123R3\DATA\CHF92

Appendix I. (Cont.)

Date	Fish No.	Disposition	Family No.	sex	Weight (gms)	Folk Ln (mm)	MEHP (mm)	In	Fin Marks	Scale No.	Card Pos.	Green Eggs	Eyed Eggs
11/23/92	114	Sacrificed	-	M	3040	715	587		None	7	1		
	115	"	-	M	4590	800	640			7	2		
	116	"	-	M	1280	550	450			7	3		
	117	"	-	M	2940	680	535			7	4		
	118	"	-	M	1800	575	472		RV	7	5		
	119	"	-	M	3940	740	590		None	7	6		
	120	"	-	M	5360	820	653		"	7	7		
	121	"	-	M	3620	730	592		"	7	8		
	122	"	-	M	3030	680	546		"	7	9		
	123	"	-	M	2380	655	545		"	7	10		
	124	"	-	M	2930	695	557		"	7	11		
	125	"	-	M	900	455	375		RV	7	12		
	126	"	-	M	5180	795	650		None	7	13		
	127	"	-	M	2140	640	624		"	7	14		
	128	"	-	M	2770	643	535		Ad	7	15		
	129	"	-	M	4190	755	603		None	7	16		
	130	"	-	M	3220	694	560		"	7	17		
	131	"	-	M	2940	680	542		"	7	18		
	132	"	-	M	2810	631	500		RV	7	19		
	133	"	-	M	5620	860	676		Ad	7	20		
	134	"	-	M	3500	712	562		None	8	1		
	135	"	-	M	1170	498	3 %		W	8	2		
	136	"	-	M	3660	720	568		None	8	3		
	137	"	-	M	3770	738	593		"	8	4		
	138	"	-	M	3350	712	570		"	8	5		
	139	"	-	M	3460	695	554		"	8	6		
	140	"	-	M	4600	785	623		"	8	7		
	141	"	-	M	6070	845	665		"	8	8		
	142	"	-	M	1910	605	491		"	8	9		
	143	"	-	M	2630	663	536		"	8	10		
	144	"	-	M	1660	557	452		RV	8	11		
	145	"	-	M	5140	793	632		Ad	8	12		
	146	"	-	M	6860	886	701		None	8	13		
	147	"	-	M	7920	941	766		"	8	14		
	148	"	-	M	3910	744	602		"	8	15		
	149	"	-	M	3520	735	581		"	8	16		
	150	"	-	M	5710	886	692		"	8	17		
	151	"	-	M	3170	717	572		"	8	18		
	152	"	-	M	940	488	400		W	8	19		
	153	"	-	M	3480	702	568		None	8	20		
	154	"	-	M	1940	637	529		"				
	155	"	-	M	2360	631	517		"				
	156	"	-	M	1080	471	391		W				
	157	"	-	M	2810	659	517		None				
	158	"	-	M	720	434	357		W				
	159	"	-	M	3340	706	549		RV				
	160	"	-	M	2180	603	4 %		None				
	161	"	-	M	1930	605	485		"				
	162	"	-	M	2320	612	495		"				
	163	"	-	M	2670	685	545		"				
	164	"	-	M	2190	645	516		"				
	165	"	-	M	3340	711	569		"				
	166	"	-	M	40 %	731	573		"				
	167	"	-	M	2660	659	524		W				
	168	"	-	M	1790	579	477		None				
	169	"	-	M	4470	747	594		"				
	170	"	-	M	2780	668	543		"				
	171	"	-	M	3310	6 %	547		"				
	172	"	-	M	1600	576	465		"				
	173	"	-	M	2240	640	524		W				
	174	"	-	M	4230	755	601		None				

Revised: 12/4/92

File Name: C:\123R3\DATA\CHF92

Appendix I. (Cont.)

Date	Fish No.	Disposition	Family No.	sex	Weight (gms)	Fork Ln. (mm)	MEHPLn. (mm)	Fin Marks	Scale No.	Card Pos.	Green Eggs	Eyed Eggs
11/23/92	175	Mortality		M	3280	699	576	Ad	9	1		
	176		M	10830	1032	841	None	9	2			
	177		M	2730	636	540	.	9	3			
	178		M	1680	540	456	.	9	4			
	179		M	6790	874	725	Ad	9	5			
	180		M	3420	693	584	None	9	6			
	181		M	2460	639	532	.	9	7			
	182		M	830	482	390	Ad					
	183		M	1090	528	u 5	Ad					
	184		M	1560	566	472	RV					
	185		M	2360	641	535	N O W					
186	M	2110	650	537	.							
11/24/92	1 8 7	Spawned	16	F	4260	721	611	None	10	1		
	188		15	F	5250	815	701	.	10	2		
	189		15	F	2570	623	515	.	10	3		
	190		15	F	4030	718	601	.	10	4		
	191		15	M	3260	6 %	570	.	10	5		
	192		15	M	9760	995	810	.	10	6		
	193		15	M	6390	860	6 %	.	10	7		
	194		15	M	4880	800	657	.	10	8		
	195		16	F	3480	692	581	.	10	9		
	196		16	F	2400	638	525	.	10	10		
	197		16	F	1800	-	465	.	10	11		
	198		16	M	3000	1105	900	Ad	10	12		
	199		16	M	2100	590	491	None	10	13		
	200		16	M	15120	652	541	.	10	14		
											17426	15438
11/24/92	M 1	Sacrificed		M	7690	907	742	N O W	10	15		
	202		M	4240	731	610	.	10	16			
	203		M	1360	523	432	W	10	17			
	204		M	7540	880	718	None	10	18			
	205		M	1800	550	454	Ad	10	19			
	206		M	8600	-	805	None	10	20			
	207		M	7610	900	736	.	11	1			
	208		M	8780	940	781	.	11	2			
	209		M	3930	721	5 %	.	11	3			
	210		M	3050	-	564	.	11	4			
	211		M	2900	628	530	.	11	5			
TOTAL											195637	182365
FECUNDITY											3373	

Revised: 12/4/92

File Name: C:\123RD\DATA\ICHF92

Appendix J. Fish sampled at the Westland Canal fish trapping facility in 1992. /1

		Salmonids														Non-game and Warm Water Species				
		Hatchery Production						Natural Production												
D a b	No. Fish Sampled	Coho (Y)	Fall Chlnook (Y)	Spring Chlnook (Y)	Fall Chlnook (SY)	Spring Chlnook (SY)	STS (Y)	Chlnook (Y + SY)	STS (Y)	STS (SY)	Coho (Y)	Coho (SY)	Chlnook (Y)	Chlnook (SY)	Suckers	Dace	Chisel-mouths	Shiners	Squawfish	Other
3-25	340	251	73	0	0	0	0	---	1	0	0	0	9	0	0	0	1	5	0	0
3-27	299	226	69	0	0	0	0	---	0	0	0	0	4	0	0	0	0	0	0	0
4-1	275	82	166	0	0	0	0	---	1	0	0	0	26	0	0	0	0	0	0	0
4-3	419	331	73	0	0	0	0	---	1	0	0	0	14	0	0	0	0	0	0	0
4-7	126	18	98	0	0	0	0	---	9	0	0	0	3	0	0	0	0	0	0	0
4-9	375	230	93	0	0	0	0	---	12	0	0	0	37	0	0	0	0	0	0	3
4-10 R	391	228	151	0	0	0	0	---	0	0	0	0	7	0	0	0	0	0	0	5
4-13 /3	307	132	144	0	0	0	0	---	9	0	0	0	21	0	0	0	1	0	0	0
4-28 /4	335	242	15	56	0	0	0	---	10	0	0	1	0	0	0	0	2	0	0	0
4-29	354	297	12	37	0	0	1	---	3	0	0	0	4	0	0	0	0	0	0	0
P-30	410	371	4	23	0	0	2	---	5	0	0	0	2	0	0	0	1	0	0	2
5-1	204	149	2	16	0	0	12	---	24	0	0	0	0	0	0	0	1	0	0	0
5-4	330	293	3	12	0	0	11	---	8	0	0	0	0	0	1	0	1	0	0	1
5-6	268	212	1	1	0	0	41	---	10	0	0	0	2	1	0	0	0	0	0	0
5-7	211	87	0	2	0	0	106	---	12	0	0	1	0	0	3	0	0	0	0	0
5-8	246	143	0	2	0	0	84	---	15	0	0	0	2	1	1	0	0	0	0	0
5-11	222	8	0	1	0	0	161	---	25	0	0	3	15	2	1	0	0	6	0	0
5-13	254	59	0	1	0	40	110	---	16	0	0	1	19	1	1	0	0	6	0	0
5-14	862	36	0	0	0	797	12	---	1	0	0	2	14	0	0	0	0	0	0	0
5-15	567	35	0	1	0	526	12	---	5	0	0	0	7	1	0	0	0	0	0	0
5-18	467	12	0	1	0	380	67	---	3	0	0	0	4	0	0	0	0	0	0	0
5-19 /5	724	16	0	0	675	26	2	---	1	0	0	0	4	0	0	0	0	0	0	0
5-w	908	4	0	0	841 /8	57	5	---	1	0	0	0	0	0	0	0	0	0	0	0
5-22 /6	795	3	0	0	771 /9	18	6	---	0	0	0	0	0	0	0	0	0	0	0	0
6-3 /7	472	15	0	0	339	82	7	25	0	0	0	1	0	0	0	0	0	1	0	2
6-4	620	8	0	0	508	78	4	19	1	0	1	0	0	0	1	0	0	0	0	0
6-6	560	3	0	0	493	34	0	29	0	0	0	1	0	0	0	0	0	0	0	0
6-11	451	3	0	0	417	5	0	25	0	0	0	0	0	0	1	0	0	0	0	0
6-15	566	4	0	0	521	7	0	32	0	0	0	1	0	0	1	0	0	0	0	0
6-17	374	1	0	0	346	2	0	24	0	0	0	0	0	0	0	0	0	0	1	0
6-19	466	0	0	0	421	7	1	32	0	0	1	2	0	0	0	0	0	0	0	2
6-23	434	0	0	0	377	0	2	51	0	0	0	3	0	0	0	0	0	0	0	1
6-26	253	0	0	0	w 7	0	1	34	0	0	0	2	0	0	4	0	0	3	1	1
6-30	457	1	0	0	327	0	1	35	0	2	0	9	0	0	16	20	0	39	4	1
7-2	355	1	0	0	254	0	0	52	0	1	0	4	0	0	3	1	3	35	1	0
7-6	2 u	0	0	0	170	0	0	59	0	0	3	2	0	0	3	1	2	3	0	2
7-10	230	0	0	0	124	0	0	70	0	0	5	0	0	0	6	4	4	6	9	2
7-13	221	0	0	0	132	0	0	58	0	0	4	0	0	0	2	2	0	17	6	0
7-17	194	0	0	0	112	0	0	2	0	1	4	0	0	0	27	5	4	11	25	3
7-27	143	0	0	0	0	0	0	1	0	0	0	1	0	0	13	1	70	45	12	0
TOTAL	15753	3501	904	153	7035	2056	648	547	173	4	18	34	203	6	86	34	90	177	59	25

Revised: 12-3-92

File Name: C:\123R2\FILES\WLD0A922

/1 Y = yearling; SY = subyearling.

/2 Water spilling over the dam on this day, creating potential for bypassing fish.

/3 High flows spilling over the dam may. Fish undoubtedly being bypassed. The trap was closed late in the evening due to muddy water and the fish in the trap showing signs of stress. They were loaded into the fish transport truck and released below the facility.

/4 The trap was reopened on 4-27-92.

/5 This fish were not hauled this by. but. sample of fish was taken at the entrance to the trap.

/6 This trap was closed 1P.M.

/7 The trap was reopened on 6-1

/8 Includes nine unmarked. A few could be natural production.

/9 Includes 45 unmarked. A few could be natural production.

J-1