

OPERATION, MAINTENANCE, AND EVALUATION OF THE  
BONIFER AND MINTHORN SPRINGS JUVENILE  
RELEASE AND ADULT COLLECTION FACILITIES

Annual Report

1987

BY

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## ABSTRACT

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

Regularly-scheduled maintenance was completed in 1987. Rock fill was brought in at Minthorn and gravel cleared from the outlet of Bonifer to repair damages from the flood of 1986. Facility upgrading was completed, and equipment and pumps received regular maintenance and repair. A survey was completed to determine the change of the Umatilla River contour in the vicinity of Minthorn after the flood.

About 150 adult steelhead were collected at Threemile Dam January through April and held at Minthorn. Sixty-seven fish were spawned, and 239,760 eggs were transferred to Irrigon Hatchery for incubation.

Acclimation and release of 102,000 fall and 100,000 spring chinook salmon was completed in 1987 at Bonifer without any major losses of fish. At Minthorn, 111,000 fall chinook and 162,000 coho salmon were acclimated and released. Substantial losses of both of these species which occurred in 1987 at Minthorn were caused by clogging of the intake pumps.

The progress of outmigration for acclimated releases was monitored at the juvenile salmonid trap located at Westland Diversion. Because fish were not branded, fish size and migration timing were used to discern general trends. Juvenile salmonids generally started showing up at the trap about 3 days after release, and as long as 2-3 months thereafter. The largest number of fish in the trap from a particular release usually occurred within a week.

Effort was initiated to collect data to assess the holding and rearing capacities of the two acclimation facilities. Thermographs and water chemistry equipment were purchased, methods to determine flow profiles were evaluated and a survey was completed on Bonifer Pond to estimate volume. Data will be collected in 1988 to start developing species-specific carrying capacities for both acclimation facilities. Contact was made with the newly-opened ODFW Eastern Oregon Fish Pathology Laboratory to initiate any necessary testing of fish and water supplies for potential pathogens.

Contacts were made to hire a subcontractor who will determine the most efficient way to use the Bonifer Facility. A request for proposals was drafted.

Preparation for acclimation research was initiated in 1987. A biologist was hired full time to operate and evaluate the facilities. Groups of summer steelhead and spring chinook salmon were tagged by Oregon Department of Fish and Wildlife under subcontract for acclimated and unacclimated release in 1988.

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## INTRODUCTION

### Background

The Umatilla River system has historically supported large populations of anadromous salmonids, including summer steelhead (Salmo gairdneri), and fall and spring chinook salmon (Oncorhynchus tshawytscha). The only native stock left in the basin is a small run of approximately 2,000 summer steelhead. Both the fall and spring runs of chinook salmon were eliminated in the early 1900's. Forestry, agriculture, irrigation and hydropower are among the developments that have impacted all of these stocks in the Umatilla River Basin.

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

### Facility Descriptions and Operations

The Bonifer Pond Facility (Bonifer) is located on the upper Umatilla River drainage at Meacham Creek rivermile (RM) 2.0. Meacham Creek empties into the Umatilla River at RM 79 (Figures 1 & 2). The pond empties into Boston Canyon Creek which flows about 50 yards before its confluence with Meacham Creek. Construction of the facility from an existing pond was completed in the fall of 1983 and operations began in early 1984. The facility consists of a one-acre pond fed by three springs that originate from 1/8 to 1/2 mile away. A concrete fishway that is used as an adult holding area, and a juvenile release culvert that runs parallel to the fishway, form the pond's two outlets.

The Minthorn Springs Facility (Minthorn) is located about four miles east of Mission, Oregon (Figures 1 & 2). Minthorn Springs Creek is formed from the confluence of several springs located immediately south of the Umatilla River. The creek is about one mile long, with the facility located near the mouth at Umatilla RM 63. The facility was completed in December of 1985 and first used for juvenile acclimation in the spring of 1986. An existing pond was not available at the Minthorn site, so two concrete raceways (120 x 12 feet) were constructed for acclimation and holding of juvenile salmonids. Water is pumped about 40 feet from Minthorn Springs Creek to the raceways. Water depth is usually held at 3

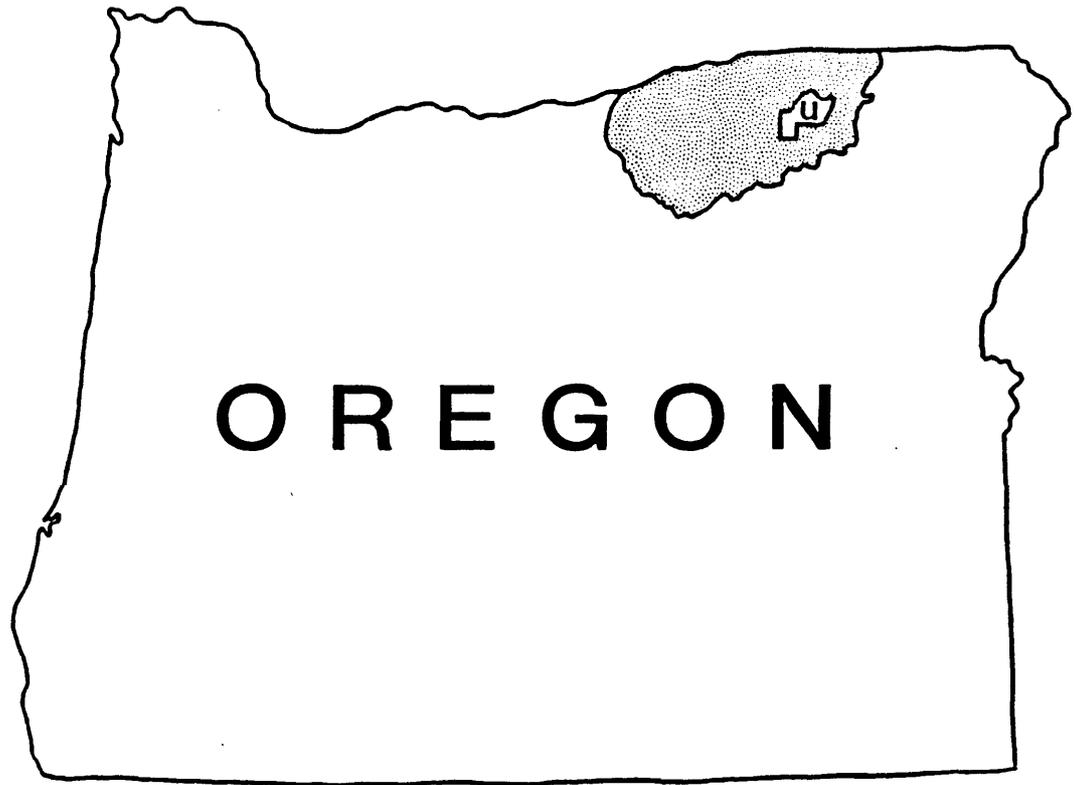


Figure 1. Umatilla River Basin and Confederated Tribes  
of the Umatilla Indian Reservation (u).

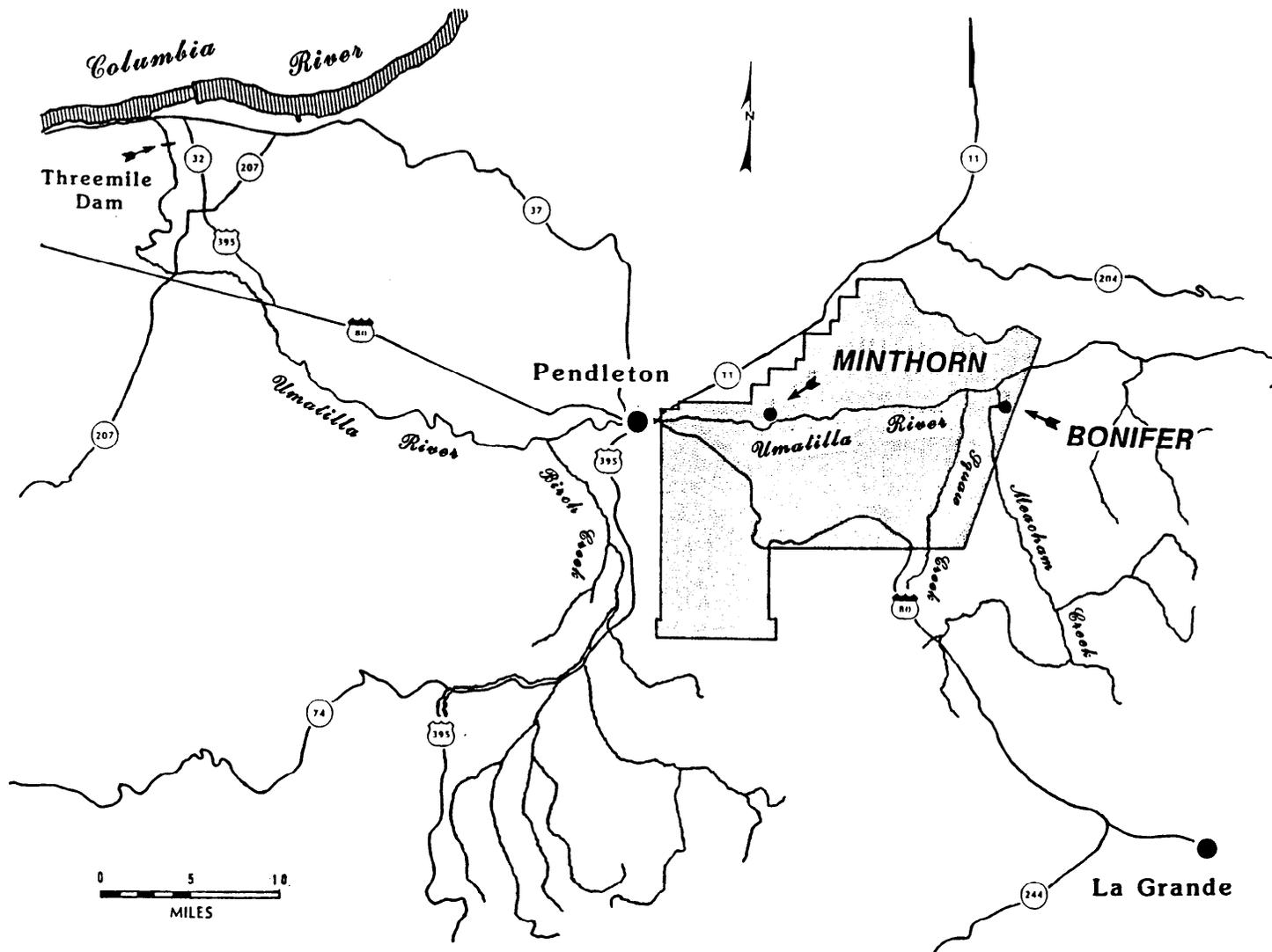


Figure 2. Bonifer and Minthorn Acclimation Facilities and vicinity.

feet with a single-pass water pumping rate of 800 gallons per minute through each raceway. The facility has the capability to release raceway outflows upstream or downstream of the pump intake. This feature allows for either recycling of flows (if desired) or release of juveniles downstream of the pump intake.

The Bonifer and Minthorn Acclimation Facilities (BMAF) are operated by CTUIR with cooperation from ODFW. The facilities have been used for holding and spawning of adult summer steelhead and for acclimation and release of juvenile fall and spring chinook salmon and summer steelhead. In addition, coho salmon were acclimated in 1987. The main goals of acclimation are to reduce stress from trucking prior to release and improve imprinting of juvenile salmonids to increase adult return to the Umatilla River. The proposed Umatilla Hatchery (scheduled for completion in 1990) will eventually be the source hatchery for these and possibly other satellite facilities slated to release juvenile salmonids in the Umatilla River Basin. Until that time, fish are being acquired from various sources. This report details activities associated with operation, maintenance and evaluation of the facilities in 1987.

#### Project Objectives

The following specific project objectives for 1987 are part of our overall objectives to operate, maintain and evaluate Bonifer and Minthorn Acclimation Facilities:

1. Operate the fish acclimation and holding facilities.
2. Collect and transport adults, juveniles and eggs.
3. Hold and artificially spawn adults; transport eggs.
4. Monitor general fish condition of adults and juveniles.
5. Maintain, repair and service equipment, building and grounds.
6. Tag test and control groups of juvenile spring and fall chinook salmon and summer steelhead.
7. Acclimate and release groups of spring and fall chinook and coho salmon and summer steelhead.
8. Cooperate in data collection at Westland trap to determine salmonid species composition, number, timing (as related to releases), length frequency and fish condition (by subjective method).
9. Compare length frequency and fish condition of pre-release and post-release sampling.
10. Obtain flow, temperature and water quality data for both acclimation facilities.
11. Monitor fish and water supplies for pathogens.
12. Determine the volume of the Bonifer Acclimation Facility.

## MATERIALS AND METHODS

### Collection and Spawning of Summer Steelhead

Adult steelhead were collected for broodstock through the cooperative efforts of CTUIR, ODFW and Stanfield-Westland Irrigation District. Fish were trapped at Threemile Dam, located three miles from the mouth of the Umatilla River. The dam has ladders on both the east and west sides. Both ladders are scheduled for renovation by the Bureau of Reclamation in 1988. The trapping facility on the west side was operated from September 29, 1986 through April 13, 1987. The ladder on the east side was functional during a portion of the run, however no fish were trapped.

Adults were transported to acclimation facilities via a 400-gallon, aerated trailer. Fish were checked for condition and sexual maturation about once every week or two. When the first fish became ripe, they were checked for maturation weekly. Ripe fish were spawned by Irrigon Hatchery personnel using standard hatchery practices. Eggs were water hardened, placed in jars, and transported to Irrigon Hatchery for incubation. They were later transferred to Oak Springs Hatchery for rearing. Incubation and rearing of steelhead eggs from adults spawned at acclimation facilities will eventually occur at the proposed Umatilla Hatchery.

A new practice was used in fertilizing and transporting of eggs in 1987. About 95% of the eggs taken in 1986 tested positive for infectious hematopoietic necrosis (IHN) or infectious pancreatic necrosis (IPN) or both. Cross-contamination was suspected to have produced such a high incidence. Precautions were taken in 1987 to reduce the risk of discarding a large number of diseased eggs. Each individual female was spawned with only one male and the eggs were fertilized, transported, and held separately. Ovarian fluid and tissue samples were taken from all fish. Eggs were only combined after each individual spawning was pronounced "clean".

### Adult Returns to Bonifer

The adult trap was set at Bonifer from the beginning of January through the end of May to collect fish expected to return there.

## Acclimation and Release of Juvenile Salmonids

Juvenile salmonids were transported by ODFW from hatcheries using 2,000 to 5,000 gallon liberation units. Transfers were completed in one to three days. Juveniles were fed 3mm Bio Diet moist pellets. Terramycin supplement was added to the diet of the summer-reared fish as a preventative measure against Columnaris. Feeding quantity was based on the amount of growth desired to reach a target size at time of release. Fish were fed once a day, in the morning at Minthorn and the afternoon at Bonifer.

Mortalities were removed daily at both facilities. When a specific disease problem was apparent in mortalities or live fish, or unexplained mortality was very high, ODFW pathology personnel were consulted.

## Outmigration Monitoring

Juvenile salmonids were collected in the trapping facility (smolt trap) at Westland Diversion (RM 27), about 54 and 36 rivermiles downstream from Bonifer and Minthorn, respectively. This was the only place that the outmigration of juvenile salmonids was monitored downstream from the release sites. In 1987, the trap was set only when flows were excessively low and fish needed to be hauled. Therefore data collection did not begin until 4/24.

Fish length category and species were recorded on an enumerated subsample of fish. The total number of fish in the trap was estimated by counting the number of fish in a "net" and estimating the number of fish in each net thereafter. The fish in every fifth or sixth net were actually counted to help adjust the estimated number of fish in each scoop as decreasing number of fish were being removed from the trap. The large number of fish trapped precluded using a number per pound estimate at this time. This would be time consuming given the limited equipment we had available. When the total number of fish was estimated, composition and length frequency of the subsample was used to estimate number and length frequency of all fish in the trap.

The trapping facility is small and may cause fish to be stressed when crowded. A new smolt trap facility is scheduled to be built as a part of the new Westland screens in 1989.

## Physical Assessment of Acclimation Facilities

As part of the Northwest Power Planning Council's Fish and Wildlife Program, the Umatilla hatchery will provide increased juvenile salmonid production for the Umatilla River Basin. Species-specific carrying capacities at the BMAF for both juveniles and adults at various times of the year are to be calculated based on water quality and quantity. Progress toward collecting the necessary data was initiated in 1987.

A limited amount of data was recorded in 1987, Temperatures were recorded at the acclimation facilities while juvenile fish were being held. A dissolved oxygen (D.O.) meter was purchased in May and a limited amount of data was recorded. Progress toward determining the volume of Bonifer Pond was initiated. A survey was completed to outline the perimeter of the pond. Depth profiles have been taken throughout the pond. A flow meter was installed at Minthorn to monitor the flow in the raceways. Because the two raceways are different heights, changes in the flow from the pump cause disproportionate changes in raceway flow. The flow in the upper raceway drops faster. The meter allows for accurate proportioning of the flow instead of estimating.

ODFW has set up a pathology laboratory to service northeastern Oregon. The laboratory was contacted and their personnel were made available as necessary to test water sources and fish for pathogens.

#### Acclimation Research

The first steps toward setting up a program to evaluate the benefits of acclimation were initiated in 1987. A biologist was hired in October to work full time on operation, maintenance and evaluation of the facilities.

Juvenile salmonids were tagged and marked by ODFW under subcontract. Three replicate tag codes were used for each test (acclimated) and control (non-acclimated) group. Chinook salmon were coded-wire tagged (CWT) and given an adipose fin clip. Summer steelhead were CWT and had both the adipose and left pelvic fin clipped. These fish are to be released at BMAF in the Spring of 1988.

## RESULTS AND DISCUSSION

### Facility Maintenance

Various maintenance activities at Minthorn were completed in 1987. The material near the adult holding area that had been washed away during the flood of February 1986 was filled with rock. Weed abatement constituted much of the normally-scheduled maintenance. All electrical and pumping equipment was checked and serviced in February before fish were delivered. In April, June and July regularly-scheduled checks and servicing were also performed. The facility was again serviced in December. A wire had vibrated loose to cause shutdown of the main pump. However, no malfunction that would have caused the failure of the back-up pump to operate could be detected. A storage shed was constructed at facility and a non-slip walkway was installed between the raceways. A field survey was completed at Minthorn to determine the present contour of the area around the outlet. Work in 1988 will center on developing alternatives to deal with the change of the river course that occurred in 1986. Gates and screens at the inlet and outlet of the facility were cleaned daily, or more often as required while fish were being held. During other times the inlet was cleaned as necessary.

Routine maintenance work at Bonifer consisted mostly of weed abatement in the work area around the outlet and maintenance of the electric fence. Work to address problems due to flooding of Boston Canyon Creek in 1986 was also initiated. Gravel that had accumulated below the bridge over Boston Canyon Creek was removed. Installation of the culvert at the outlet of Bonifer was postponed. Upon digging for installation, several large upright timbers were uncovered. The culvert will have to be put in above the gravel or another outlet to Meacham Creek will have to be developed. The cobble dam at the inlet of Bonifer Springs Creek was rebuilt before the first group of fish was transferred to the facility.

## Collection and Spawning of Adult Sumner Steelhead

A total of 148 adult steelhead were trapped at Threemile Dam and transported to BMAF (Table 1). Fish were collected throughout a spectrum of the run from January through April.

Minthorn was used for holding a portion of the adult steelhead for the first time. All other fish were held at Bonifer. The 24 fish held at Minthorn were transported to Bonifer in early April so that all spawning operations could be conducted at one facility.

Prespawning mortality during the adult holding period was 24% (Table 2), higher than previous years at Bonifer (1986 22%; 1985 10%; 1984 8%) but still not as severe as that which occurred in holding ponds at McNary Dam, prior to the completion of Bonifer during 1983 (52%). A total of 35 adults died in 1987 before spawning operations were completed in late April. Thirty-seven females, 41% of those collected, were spawned and an estimated 239,760 eggs were taken (Table 2).

The sample for disease analysis of fish spawned on April 9, 1987 did not arrive at the laboratory in condition that would allow disease tests. Since all tests for other groups proved negative, and eggs belonging to the untested sample were not needed, no chance was taken and they were destroyed. A total of 160,488 eggs were combined and incubated together.

### Adult returns to Bonifer

No adult steelhead were caught in the trap at Bonifer in 1987, although seven 1-salt fish returned in 1986. Several steelhead were observed in Meacham Creek near the mouth of Boston Canyon Creek in March and April. Some of these fish may have been those expected to return to Bonifer, but low flows in Boston Canyon Creek evidently failed to attract the fish. No steelhead redds were found in the lower one mile of Boston Canyon Creek this year, although some were observed in 1986 and 1985. Any returns from the natural and hatchery (Bonifer) releases most likely spawned in Meacham Creek.

Table 1. Collection of steelhead broodstock 1986-87. 1/

Date	Males	Females	TOTAL
January 9	0	4	4
February 6	19	14	33
February 10	6	12	18
February 13	8	8	16
February 17	5	8	13
February 20	0	5	5
February 25	5	6	11
March 2	2	10	12
March 6	5	4	9 2/
March 12	0	15	15 2/
April 13	3	5	8
April 20	4	0	4
	===	===	===
TOTALS	57	91	148

Filename:STCOL87A

1/ All adults trapped at Threemile Dam.

2/ Adults transported to Minthorn; all others went to Bonifer-

Table 2. Steelhead broodstock spawning and mortality at Bonifer Acclimation Facility - 1987.

Date	FISH SPAWNED Female	Male	Egg take	Prespawning Mortality
April 1	7	5	44,712	3
April 3	0	0		1
April 9	12	11	79,272 1/	5
April 13	0	0		1
April 14	0	0		2
April 15	11	9	69,552	5
April 20	0	0		5
April 21	0	0		4
April 22	7	5	46,224	9
	====	----		----
TOTALS	37	30	239,760	35 2/

Filename:STMOR87A

1/ Eggs taken on this day were discarded.

2/ Sex of mortalities was not recorded.

Unused fish (46) were released live into the Umatilla River.

## Acclimation and Release of Juvenile Salmonids

Five groups of acclimated juvenile salmonids were among the almost 3 million fish released into the Umatilla River in 1987 (Table 3). A total of 475,292 fish were acclimated at BMAF in 1987, 162,106 of these having one of sixteen distinct coded-wire tags (Tables 4 & 5). Fall chinook salmon have been released in the Umatilla River every year since 1982 and from acclimation facilities since 1983 (Table 6). In 1982, this release was of tule stock. Since then all releases have been of upriver bright stock (Bonneville). This is the second year that spring chinook salmon and the first year that coho salmon have been acclimated and released. These fish are of Carson and Toutle stocks respectively. Summer steelhead have been released a number of times in the Umatilla River Basin in the past. However, since 1981 only broodstock taken from the Umatilla River have been used (Table 6).

Few disease problems occurred this year. The only group of fish in which problems started to appear was the fall chinook salmon released at Min thorn in June. An infection of Ichthyophthirius (Ich) developed shortly before most all of the fish were subsequently lost due to pump failure. Columnaris, which was a problem last year, did not appear in the fish, perhaps due to feed supplemented with Terramycin as a preventative measure.

## Acclimation at Bonifer

Only two lots of fish were acclimated at Bonifer in 1987. Extended rearing through the summer was not attempted this year. Problems with past summer rearing suggested that some physical or operational modifications may be required before summer rearing is again attempted. A sub-contractor will be hired in 1988 to evaluate limiting factors and some of the problems we have experienced in the past at Bonifer. Among these will be some specific problems that are unique to summer rearing.

Summer steelhead were not acclimated in Bonifer this year due to the limited availability of juveniles. Disease problems with IPN and IHN in 1986 reduced the number of eggs incubated to about 5,000 (James 1986). The number of fish available was also reduced to near 1,500 (Table 3) due to nitrogen problems during rearing at Oak Springs Hatchery (personal communication, Bill Tansley).

Table 3. Juvenile salmon and steelhead released in the Umatilla River Basin - 1987.

Specfra	Brood Stock	Hatchery	Number	W/lb.	Location	In facility	In river	Fish mark 1/	
Fall chin.	85	Bonneville	Bonneville	109,143	8.1	Minthorn	March 3-4	March 29	CWT 49,635
Fall chin.	89	Bonneville	Bonneville	102,363	8.0	Bonifer	March 5-6	March 20-23	CWT 30,492
Fall chin.	86	Bonneville	Irrigon	2,000	20.0	Minthorn	June 5	July 13	CWT 1,920
Fall chin. 4/	86	Bonneville	Irrigon	1,476,830	5/ 60.4	Uma. RM 9	-----	May 5-8	CWT 121,076 W---V--
Total			1,690,336					223,123	
Spring chin.	as	Caraon	Caraon	99,897	10.4	Bonifer	March 24	April 21-24	NO
Spring chin. 41	85	Caraon	Oxbow	169,100	6/ 199.0	Upper Uma.	-----	April 9	NO
Total			268,997						
Early coho	85	Toutlr	Cascade	161,889	13.5	Minthorn	April 1-3	April 24-29	CWT 60,059
Early coho 4/	85	Toutlr	Cascade	786,660	7/ 14.0	Uma. RM 24	-----	April 14-21	NO
			948,549						
SUB. stld. 4/	86	Umatilla	Oak Springs	1,485	3.5	Mea. Rm 11	-----	May 13	all ad. only
Overall total			2,909,367						

File name: FIRPL87A

1/ Fish considered marked must have both a coded-wire tag and an adipose fin clip unless otherwise noted.

2/ Estimated survival of emergency release.

3/ Estimated size Size before emergency release was 25.0/lb

4/ Source of information, ODFW.

5/ Fish released at Steelhead Park near Hermiston.

6/ Fish release in the N. Fork and S. Fork of the Umatilla River and N. Fork of Meaches Creek.

7/ Fish released below Westland Dam (Stanfield Area).

Table 4. Liberation and return information for upriver bright fall chinook salmon coded-wire tagged and released in the Umatilla River Basin

Brood	Total Number	Release Time	Size (#/lb.)	Number Tagged 6/	CWT Coda	Release Location	Expected return year 5/					
							84	85	86	87	88	89
81	100,500	March 83	5.9	100,500	072141	Bonifmr f Meacham Cr.	J	4	5			
82	222,580	March 84	8.6	94,610	072829	Bonifrr f Meacham Cr.11	J	4	5			
83	636,759	June 84	86.0	195,824	073124	Lower Umatilla	J	4	5			
83	198,145	March 85	7.8	89,762	073127	Bonifmr E Upp. Umat.	J	4	5			
84	3,221,993	June 85	92.0	228,478	073326	Bonifor f Upp. Umat. /2	J	4	5			
84	50,000	Oct 85	16.0	30,830	073162	Bonifor /3	J	4	5			
84	216,000	March 86	5.0	93,100	073327	Bonifor C Minthorn/4	J	4	5			
85	22,216	March 87	8.1	12,113	073823	Ninthorn				J	4	5
85	22,523	March 87	8.1	12,280	073024	Ninthorn				J	4	5
85	21,807	March 87	8.1	11,890	073825	Minthorn				J	4	5
85	20,881	March 87	0.1	11,385	073826	Ninthorn				J	4	5
85	21,716	March 87	0.1	11,040	073827	Minthorn				J	4	5
Total	109,143			56,408								
85	20,786	March 87	8.6	10,253	073820	Bonifrr				J	4	5
85	20,212	March 87	8.6	9,970	073029	Bonifor				J	4	5
85	20,546	March 87	8.6	10,135	073830	Bonifer				J	4	5
85	20,381	March 87	8.6	10,053	073831	Bonifor				J	4	5
85	20,430	March 87	0.6	10,081	073832	Bonifer				J	4	5
Total	102,363			30,492								
85	497,572	May 87	60.4	40,793	073912	Lower Umatilla				J	4	5
85	501,266	May 87	60.4	41,096	073913	Lower Umatilla				J	4	5
85	477,992	May 87	60.4	39,187	073914	Lower Umatilla				J	4	5
Total	1,476,830			121,076								
85	670 7/	July 87	25.0	643 7/	073915	Minthorn				J	4	5
85	672 7/	July 87	25.0	645 7/	073916	Minthorn				J	4	5
85	658 7/	July 87	25.0	632 7/	074035	Minthorn				J	4	5
Total	2,000			1,920								

Filename:CHFTG87A

- 1/ All tagged fish released in upper Meacham Crook.
- 2/ Tagged fish released both at Bonifer (37,637) and Upper Umatilla Rivrr (32,125).
- 3/ Fish were roared through l uaner and released from Bonifer in fall.
- 4/ Tagged fish released at Minthorn (93,000); untagged at Bonifmr (123,000).
- 5/ J-B-year-old (mostly males); 4.4-old; 3.5-year old.
- 6/ Number tagged for 1987 releases refers only to fish with both a coded-wire tag and a recognizable fin clip.
- 7/ Estimated number of total and tagged fish assuming 2,000 l survivor, l irilyly proportioned as at the time of transfer and assuming 4x tag loss.

Table 5. Liberation and return information for coho salmon coded-wire tagged and released in the Umatilla River Basin.

Brood	Total number	Release time	Size (#/lb.)	Number tagged	CWT code	Release location	Return 1/88
85	37,245	April 87	13.5	13,440	073617	Minthorn	3
85	53,754	April 87	13.5	19,879	073624	Minthorn	3
85	70,890	April 87	13.5	26,740	073625	Mnthorn	3

Filename : COHTG87A

1/ Expected year of return as adults: 3 = 3 year-olds.

Table 6. Juvenile steelhead and salmon releases in the Umatilla River - 1980-8 [11].

Species	Steelhead Trout		Fall Salmon Chinook		Spring Chinook Salmon		Coho Salmon		Minthorn	
	Upper Umatilla	Bonifer	Lower Umatilla	Upper Umatilla	Bonifer	Ninthorn	Upper Umatilla	Bonifer		
Year										
1981	17,558 (y) 9,400 (sy)	0	0	0	0	0	0	0	0	
1982	39,494 (y) 67,940 (sy)	0	3,828,500 (sy) [2]	0	0	0	0	0	0	
1983	60,500 (y) 521,700 (sy)	0	0	80,500 (y)	20,000 (y)	0	0	0	0	
1984	0	57,939 (y) 22,000 (sy)	636,759 (sy) [3]	169,280 (y)	53,300 (y)	0	0	0	0	
1985	0	53,850 (sy) 39,134 (sy)	3,221,993 (sy) [3]	60,490 (y)	137,653 (y) 50,000 (sy) [4]	0	0	0	0	
1986	0	54,137 (y)	2.03 mill (sy) [3]	0	100,000 (y)	90,841 (y) 331,574 (sy)	300,442 (sy)	99,070 (y) 75,000 (sy) [4]		
1987	1,483 (y) 151	0	1,476,565 (sy) [6]	0	102,363 (y)	111,143 (y) [8]	169,100 (sy)	99,897 (y)	786,166 (y) (71)	161,889 (Y)

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Filename : AYREL87A

- [1] y = fish released as yearlings, just prior to downstream migration  
 1y = fish released as 1 sub-yearlings: fall chinook 1 salmon will migrate following release:  
 steelhead and spring chinook salmon will rear another year.  
 [2] Salmon released in 1982 was tulle stock, all other8 have been upriver brights -- the desired stock.  
 [3] Fingerlings released below Three Mile Dam to avoid loae in irrigation diversion.  
 [4] Sub-yearlings were reared at facilities in summer 1 nd released in late October at yearling size (11 to 16/lb.).  
 [5] Small releases in Meacham Creek (RM 11) due to IHN C IPN virus problem with 1 steelhead 1 gge taken in 1986.  
 [6] Fish released at Steelhead Park near Hermiston.  
 [7] Fish released below Weatland Dar (Stanfield area).  
 [8] 2,000 is the 1 attributed number of 1 survivor for the emergency release.

#### Fall chinook salmon - 3/5

The first lot of fish acclimated at Bonifer in 1987 consisted of 1985 brood yearling fall chinook salmon (Table 3). ODFW transferred the fish from Bonneville Hatchery to Bonifer on 3/5-6. Fish were CWT with 5 different codes (Table 4). Transfer mortality was 18 while observed mortality recorded over the acclimation period was 88 fish. Because silt and vegetation cover much of the bottom of Bonifer, observed mortality is not a total count. This small count, however, indicates that heavy mortality did not occur. Temperature during acclimation ranged from 43 to 48 with an average of 45 degrees F. Fish were fed about 50 pounds of food per day.

Release of fish occurred 3/20 through 3/23 at 8.0/lb. (Table 3). Of the 102,363 fish that were released, 50,492 had coded-wire tags (Table 4). When the stoplogs were pulled, most of the water was drained from the pond except that which continued to flow in from the springs. Only a few fish were observed in the spring flow on 3/23 and these were removed.

#### Spring chinook salmon - 3/24

The second lot of fish acclimated at Bonifer was 1985 brood spring chinook salmon which were reared at the Carson Hatchery (Table 3). ODFW transferred fish to the Bonifer Facility on 3/24. These yearling fish were neither tagged nor marked. However, they should be discernible by scale analysis and timing of return as adults. Spring chinook salmon that will be acclimated in 1988 will be coded-wire tagged. Mortality was 32 from transfer and total observed mortality was 126 fish. Temperature during acclimation ranged from 45 to 50, with an average of 48 degrees F. Fish were fed about 60 pounds of food per day during acclimation. Fish size at pre-release sampling on 4/21 was 10.4/lb. (Table 3). Stoplogs were pulled 4/21 through 4/24 and the last fish left the pond 4/24.

## Acclimation at Minthorn

Three lots of fish were held at Minthorn. Two of these were for short-term acclimation. The last was to be for over-summer rearing and fall release of fall chinook salmon as was completed for the first time at Minthorn during 1986.

### Fall chinook salmon - 3/3

The first lot of fish held at Minthorn in 1987 was yearling fall chinook salmon (1985 brood) that were reared at Bonneville Hatchery (Table 3). ODFW transferred fish into the upper raceway on 3/3 and the lower raceway on 3/4. Fish of five different tag codes were held together at the hatchery and were not specifically transferred into the upper or lower raceway. Transfer mortality totaled 74 fish while mortality over the whole acclimation period was 303. Temperature ranged from 44 to 50 and average 47 degrees F. Fish in each raceway were fed 25 to 30 pounds of food per day until release on 3/29. Of the fish released, 49,635 were tagged (Table 4).

### Coho salmon - 4/1

The second lot of fish acclimation at Minthorn were 1985 brood early coho salmon from Cascade Hatchery (Table 3). These fish were tagged with three different tag codes (Table 5). Fish with tag codes 073624 and 073617 were transferred into the upper raceway on 4/1 and 4/2 respectively. On 4/3 two transfers were made into the lower raceway, another de 1 very of fish with tag code 073624 and tag code 073625. Transfer mortality was 43 in the upper raceway and 54 in the lower.

During acclimation, temperatures varied from 46 to 52, with an average of 49 degrees F. Fish in each raceway were fed from about 50 pounds of food per day. Total mortality in the lower raceway was 178 fish.

Mortality in the upper raceway was much higher. Severe clogging of the pumping system caused very low flows and, presumably, low dissolved oxygen on 4/23. Emergency procedures were followed, and mortality and stress were assessed at the time the trouble was discovered. After 50% mortality was estimated, and the fish were continuing to exhibit symptoms of stress even after higher flows had been resumed, the decision was made to release the survivors. These fish were scheduled to be released shortly anyway. The stoplogs were pulled in the upper raceway and fish were allowed to migrate into Minthorn Springs Creek. An estimated 50% of the fish with tag code 073617 was lost while the percentage loss of fish with tag code 073624 was not as severe (23%) because a number of fish with the latter tag code were in the lower raceway.

Fish in the lower raceway were released without incident. The lower raceway was sampled and fish were released at 13.5/lb. and 4/29. The size of fish released from the upper raceway was reported as the same. Of the 161,889 fish released, 60,059 had coded-wire tags (Table 5).

This was the first year that juvenile coho salmon have been released in the Umatilla River Basin. In 1967, CTUIR used the Minthorn Springs Creek site for hatching and release of coho fry (Fisheries Assistance Office, U.S.F.W.S. 1980). A run never developed.

#### Fall chinook salmon - 6/5

The final transfer of fish into Minthorn was 1986 brood fall chinook salmon reared at Irrigon Hatchery (Table 3). Fish were tagged with five different tag codes and were not segregated by raceway (Table 4). This transfer on 6/5 was to be for extended rearing with a mid-October release. All were transferred in the same deliver and approximately half of the fish were placed in each of the raceways. Mortality from transfer was 195 fish. Fish were fed 25 to 50 lbs. of food per raceway per day from transfer date through 7/13, progressively increasing the daily ration as growth occurred. Water temperature ranged from 54 to 62 throughout the holding period, averaging 57 degrees F.

Because problems had been encountered in the past with low flows and (presumably) dissolved oxygen, measurements (D.O., measured in milligrams per liter (mg/l)), were taken regularly. Through 6/30, D.O. levels fluctuated, with maximums occurring at the heads of raceways (up to 9.4 mg/l) and minimums occurring at the outlets (as low as 6.6 mg/l). When differences did exist in D.O. measurements between raceways on a particular day, lower measurements were always taken in the upper raceway, because lower head affects the flow in that raceway more dramatically. Differences between the measurements taken at the head versus the outlet of the same raceway did not exceed 2.0 mg/l until 7/1.

Problems with clogging of the pump intake became extreme on 7/1, and flows in the upper raceway were greatly reduced. Dissolved oxygen dropped below 7.8 mg/l for the first time at the head (6.6) and below 6.6 mg/l (3.3) at the outlet of the upper raceway (Table 7). The D.O. in the lower raceway also dropped but not nearly as far. The situation was corrected and mortalities did not noticeably increase in the next three days. However, severe clogging of the intake screens and subsequent loss of flow on 7/4 and 7/5 caused back to back second and third severe drops in flow and D.O. in the upper raceway (see outlet reading, Table 7). High mortality followed these low D.O. readings in the upper raceway.

Table 7. Dissolved oxygen readings and Juvenile mortalities at the Minthorn Facility in 1987.

Date	Upper Raceway			Lower Raceway		
	Head	Outlet	Mortality	Head	Outlet	Mortality
6/5			84			105
6/6-29*	7.8	6.6	102			90
6/30	8.2	6.8	3	9.2	7.8	2
7/1	6.6	3.3	3	7.3	5.2	2
7/2	8.5	7.7	0	a.7	a.2	0
7/3	7.6	6.0	2	a.7	6.9	1
7/4	6.7	4.7	14	8.1	6.2	2
7/5	7.2	4.8	200	8.1	6.4	24
7/6	7.4	6.4	460	7.6	6.6	8
7/7	**	**	100	**	**	22
7/8	**	<b>5.3</b>	49	<b>6.4</b>	5.4	13
7/9	**	**	27	8.8	7.4	7
7/10	7.4	<b>5.8</b>	44	7.9	6.6	3
7/11	8.2	7.4	42	8.4	7.2	12
7/12	8.0	7.0	20	a.2	7.4	8

Filename:DOMIN87A

\* D.O. measurements are extreme lows recorded, and mortality is the total mortality, over these datee.

\*\* Data not recorded.

Fish in the lower raceway evidently did not experience as severe an oxygen depletion, and mortality was much lower (Table 7). Fish were sampled for length and weight on 7/1. Infections of what appeared to be Ich were noted on 7/1 and again on 7/4. On 7/7 samples of fish were sent to Warren Groeberg of ODFW for pathological analysis. Results confirmed presence of Ich (100/gill arch). Tests for Columnaris, furunculosis and enteric redmouth were negative. Fish were treated for Ich, and treatment with terramycin as a preventative measure for Columnaris was continued.

Sometime on the afternoon of 7/12 the main pump shut down and the auxiliary pump did not come on. When staff returned in the early evening to check on the fish, mortality was presumed to be 100%. The pumps were turned back on anyway. The next day while cleaning up it was discovered that "a few" fish had survived. An estimated 2,000 fish were released immediately (Table 3) because it was not worthwhile to continue pumping with so few fish. The number of each tag code recorded as being released is based upon the initial proportions of each code when the fish were transferred (Table 4).

#### Outmigration Monitoring

Data collection at the juvenile salmonid trap at Westland was limited to periods when fish were hauled. Outmigration was not monitored for the first releases at Bonifer (102,000 fall chinook salmon on March 20) and Minthorn (109,000 fall chinook salmon on March 29).

When fish were first collected on 4/24, flows were increasing and the catch was composed of naturally-produced (hereafter called "wild") steelhead and chinook salmon (most likely from the release of spring chinook salmon at Bonifer on 4/21 with a few fall chinook salmon from earlier releases). The hatchery release of steelhead was not until 5/13. No specific groups were marked so that stocks or release groups of chinook salmon could be distinguished from one another.

The peak number counted at the trap for every species occurred on 4/29. Thereafter, until 5/13, flows were considered adequate to pass fish, and the trap was left open. No samples were taken during this time.

The steelhead that were released on 5/13 probably showed up at the trap shortly afterward, however the small number of hatchery fish was probably swamped by wild fish. Hatchery and wild fish were not distinguished during sampling. However, given that the average size of the hatchery fish was 7.5 inches at release, it would seem that most of the fish under 6 inches were probably wild fish. Of the fish that could have been of hatchery origin (were "large" and showed up at the trap after 5/13), most migrated in May, with a few late fish extending the run through the middle of June (Table 8).

Table 8. Juvenile salmondis captured at Weatland Smolt Trap - 1987. 1/

Size(in.) Date	Steelhead			Chinook l alaon			Daily Total	Coho l aleon
	4-5.9	6.0"	Daily Total	2-3.9	4-5.9	6.0"		
04/24/87 2/	0	18	18	0	450	0	450	0
04/26/87	74	40	114	0	0	118	118	673
04/27/87	0	21	21	0	200	176	376	896
04/29/87	1306	3000	4306	0	1222	1779	3001	8426
05/13/87 3/	0	374	374	0	600	654	1254	572
05/14/87	160	53	213	0	57	57	114	383
05/15/87	200	54	254	0	70	68	138	458
05/16/87	150	300	450	0	50	200	250	300
05/17/87	200	250	450	0	50	150	200	250
05/18/87	400	230	630	0	120	195	315	555
05/19/87	200	140	340	0	281	350	631	0
05/20/87	80	74	154	0	50	59	109	0
05/22/87 5/	0	335	335	0	74	223	297	608
05/23/87	22	50	72	0	312	300	612	228
05/24/87	73	100	173	0	84	100	184	4
05/25/87	24	90	114	75	26	0	101	44
05/26/87	0	124	124	172	0	59	231	237
05/27/87	0	295	295	58	0	30	88	33
05/28/87	0	99	99	76	0	32	108	21
05/29/87	0	102	102	78	0	33	111	22
05/31/87	180	8	188	200	0	60	260	0
06/01/87	0	72	72	260	0	39	319	60
06/03/87	35	76	111	458	0	63	521	78
06/05/87	0	60	60	264	0	61	325	71
06/07/87	0	10	10	250	0	40	290	10
06/08/87	0	11	11	308	0	18	326	11
06/11/87	20	46	66	613	0	37	650	15
06/13/87	10	0	10	256	0	8	264	12
06/17/87	2	15	17	236	0	25	261	0
06/19/87	4	25	29	350	0	22	372	2
06/22/87	0	1	1	130	0	20	150	2
06/24/87	0	1	1	85	0	12	97	0
06/26/87	4	0	4	56	0	53	109	4
06/29/87	0	0	0	21	0	5	26	0
07/02/87	0	0	0	8	0	4	12	0
07/06/87 4/	0	2	2	2	0	44	46	1
07/11/87	1	0	1	43	0	7	50	0
07/17/87	0	0	0	12	0	0	12	0
07/20/87	0	0	0	26	0	0	26	0
07/27/87	0	0	0	24	0	0	24	0
07/31/87	0	0	0	0	0	0	0	0
08/07/87	1	0	1	6	0	0	6	0
08/11/87	0	0	0	2	0	0	2	0
08/17/87	0	0	0	0	0	0	0	0
08/21/87	0	0	0	0	0	0	0	0
08/24/87	0	0	0	0	0	0	0	0
<b>Totals</b>	<b>3,146</b>	<b>6,076</b>	<b>9,222</b>	<b>4,069</b>	<b>3,646</b>	<b>5,121</b>	<b>12,836</b>	<b>13,978</b>

Filename:WST-J87A

- \* Trap was not operated 4/30 to 5/12 due to adequate flows for passage.
- 1/ Collected by ODFW and CTUIR Fisheries Department (under non-BPA funding).
- 2/ Release March 20 : 102,000 fall chinook salmon :Bonifer
- Release March 19 : 109,000 fall chinook salmon :Minthorn
- Release April 21 : 100,000 spring chinook salmon :Bonifer
- Release date : 162,000 coho salmon :Minthorn
- 3/ Release date : 1,500 summer steelhead :Meacham Creek
- 4/ Release July 13 : 2,000 fall chinook salmon :Minthorn
- 5/ All water was diverted after this date (i.e. trap efficiency = 100%).

Coho salmon first showed up at the smolt trap on 4/26 (the trap was not checked on 4/25) and the last one went through the trapping facility on 7/6 (Table 8). Of the days when fish were counted, 4/29 was the peak, with 8426 coho salmon being captured for 48 hours of trapping (4213/day). Seventy-two percent of the coho salmon that were trapped had passed the facility by this date. The percentage having passed the trapping facility is probably not representative of the run because samples were not taken 4130 through 5/12. Prior to 4/30 the number of fish migrating was increasing, and the peak may have occurred when the trap was not functional. Of the fish that were trapped, 98% had passed the trap by the end of May. A total of about 14,000 of the 162,000 coho salmon released above Westland were trapped (9%) (Table 8).

Chinook salmon showed up at the trap on 4/24, as early as 3 days following a release at Minthorn (Table 8). It was presumed that most of the chinook salmon showing up at the trap were from this Minthorn release, as previous releases had been almost a month earlier. The number of chinook salmon being trapped peaked at 1500/day on 4/29. The peak of the fish actually migrating through the trap probably occurred during the high flows. Smaller fish from acclimated releases moved out by the latter part of May, while larger fish migrated through June. About 13,000 of the 313,000 acclimated chinook salmon were trapped (4%).

Very small chinook salmon (2-3.9 inches) that migrated in late May through July were the result of a subyearling spring chinook salmon release in the upper Umatilla River (Table 3). Although these fish were expected to migrate as yearlings a year later, about 4,000 of the 169,000 subyearling that were released migrated and were trapped.

#### Physical Assessment of Acclimation Facilities

Temperatures and D.O. measurements that were recorded at the acclimation facilities are reported with associated acclimation periods. No other data were recorded. Most data collection will be initiated in 1988.

The expertise at the ODFW NE Oregon Pathology Laboratory was called upon to test the fall chinook salmon that were being held at Minthorn on 7/7. Tests for Ich were positive, while those for Columnaris, furunculosis and enteric redmouth were negative.

#### Acclimation Research

Tagging was the only research activity completed in 1987. For the first time, study fish (test and control groups to test the benefits of acclimation) were tagged.

Table 9. Coded-wire tagging of Juvenile salmonida - 1987  
for release into the Umaila River.

Species	Brood	Hatchery	Mark	Size (#/lb.)	Tag Month	Release Month	Release site	Number Tagged	CWT Code
Spring chinook salmon	86	Bonneville	AD	33	August 87	April 88	Bonifrr	27,475	074325
								26,677	074326
								26,666	074327
								80,818	
Spring chinook salmon	86	Bonneville	AD	33	August 87	April 88	Meacham Cr.	27,242	074328
								26,629	074329
								27,175	074330
								-a-----	
								81,046	
Summer steelhead	87	Oak Springs	AD+LV	60	November 87	May 88	Bonifer	10,454	073859
								10,339	073860
								10,556	073861
								31,349	
Sumner eteelhead	87	Oak Springs	AD+LV	60	November 87	May 88	Meacham Cr.	10,560	073856
								10,350	073857
								10,297	073858
								31,162	

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AD = adipose fin clip  
LV = left pelvic fin clip

Filename:87CWT87A

Two groups of summer steelhead were tagged for the study. A test group consisting of three replicates totaling 31,349 fish was tagged and is to be acclimated at Bonifer in 1988. A control group consisting of three replicates totaling 31,162 fish was tagged and will be released directly into the stream at the time of the acclimation release (Table 9).

Two groups of spring chinook salmon were tagged for the study. A test group consisting of three replicates totaling 80,818 fish was tagged and is to be acclimated at Bonifer in 1988. A control group consisting of three replicates totaling 81,046 fish was tagged and will be released directly into the stream at the time of the acclimation release (Table 9).

A group of spring chinook salmon that was scheduled for tagging in 1987 for a fall release were not tagged. Fall flows were unusually low and rearing space was available at Bonneville Hatchery, so the decision was made to hold the fish longer and release them in the Spring of 1988 as untagged yearlings.

#### Project Difficulties

##### Operational problems at Bonifer

Complete drainage of the pond was a problem again this year due to:

- 1) The lower portion of Boston Canyon Creek was channelized and recent flows (a 50-year flood occurred in 1986) have caused unstable banks to wash out. The resultant bedload has been dumped as the creekbed narrows at the outlet of Bonifer before going under the railroad bridge and emptying into Meacham Creek;
- 2) The water backs up into Boston Canyon Creek to such an extent that there is little difference in elevation between the height of Boston Canyon Creek and that of the outlet of Bonifer when we are attempting to drain the pond. Seining was required this year to remove fish from an undrainable portion of the pond.

In an attempt to keep gravel from clogging the culvert for release of juvenile fish, we had planned to connect a 90 degree angle to the end of the present release culvert and run 40 feet of culvert along Boston Canyon Creek toward Meacham Creek. Upon completing some initial excavation below the railroad bridge, several large timbers set upright were uncovered under the surface of the gravel. Attempts to remove them were abandoned after they could not be budged with a small tractor. The depth to which they extend is not known.

As in previous years, some juveniles migrated into the main feeder spring for Bonifer. Although a "barrier" (cobble dam) across the spring entrance remained intact, fish were seen in the ponds above the entrance of the main spring. This will remain a recurrent problem until an impassable barrier can be placed at the inlet to Bonifer.

#### Operational problems at Minthorn

The main problem at Minthorn was clogging of the pump intake system. Although screens are in place, algae that grows in the spring and the pond above the inlet tend to clog the system relatively quickly. Flow in the upper raceway was affected most severely, because of greater pumping head.

A recurrent problem has been the occasional malfunction of the alarm system. The alarm has sometimes been activated when there was a problem. Potential problems that should cause alarm activation are:

- 1) water in a raceway was too high or too low.
- 2) water in the adult fishway was too high or too low.
- 3) power failure.
- 4) pump failure.

The back-up generator is equipped to come on in the event of a power failure. When the pump system switches from the main pump to the auxiliary pump the alarm has sometimes not been activated. During both the acclimation of coho and the second group of fall chinook salmon, the pumping system malfunctioned. The alarm was not activated in the case of clogging of the intake while the coho salmon were held, although it was activated while the chinook salmon were held. In the second instance, the fisheries personnel were not contacted by the tribal police. Fish losses represent about 25% of the coho and 53% of the fall chinook salmon that were acclimated at Minthorn.

#### Research Problems

Documenting the number of fish released at Bonifer has been a recurrent problem. The number of fish transferred into the facility is available through hatchery records. In 1987, mortality was very low, and recorded mortality was probably not much less than actual mortality. However, in past years when disease and other problems caused large losses, the number of fish that were released was an estimate that could have been subject to an unquantifiable error. Extensive aquatic vegetation that has posed quite a problem with retrieving mortalities in the past was not much of a problem this year, as fish were not held in the summer when most of the growth occurs.

Information on the outmigration of particular releases has been very difficult to determine. In 1987, all coho released above the trap were from Minthorn, and therefore this release could be easily tracked. However, multiple releases in the future will make it difficult to distinguish release groups. Although late releases of fall chinook in June might have been easily distinguished from earlier releases by size, length intervals into which fish were categorized in 1987 were very broad, and distinguishing fish based upon size was difficult. The small steelhead release could have been distinguished from the wild run by presence of clipped adipose fins, but this information was not collected.

#### Facility Evaluation - Subcontract

In 1987, a Request for Proposal was drafted for a Bonifer Evaluation study. The subcontractor will be selected and evaluation initiated in 1988.

SUMMARY OF EXPENDITURES

Expenditures for activities associated with the operation, maintenance and evaluation of Bonifer and Minthorn Acclimation Facilities totaled \$73,156.13. Most expenditures were for personnel and capital equipment (Table 10).

Table 10. Expenditures for Bonifer and Minthorn Facilities operation, maintenance and evaluation for 1987.

Line Item	Expenditure
Personnel	23,677.29
Travel (all)	5,781.56
Fish food	2,344.39
Property lease	1,440.90
Facility insurance	710.00
Electricity/utility	1,250.00
Materials and supplies	3,848.17
Telephone/alarm	803.49
Equipment servicing	2,074.83
	-----
Subtotal	41,930.63
Indirect	7,248.62
Sub-contract	7,316.30
Capital equipment	
Coded-wire tag injector	11,265.00
Electronic flow meter	2,002.93
Electronic thermographs (4) and cases (2)	2,522.65
Dissolved oxygen meter	870.00
Subtotal	16,660.58
TOTAL	73,156.13

-Filename: EXPEN87A

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