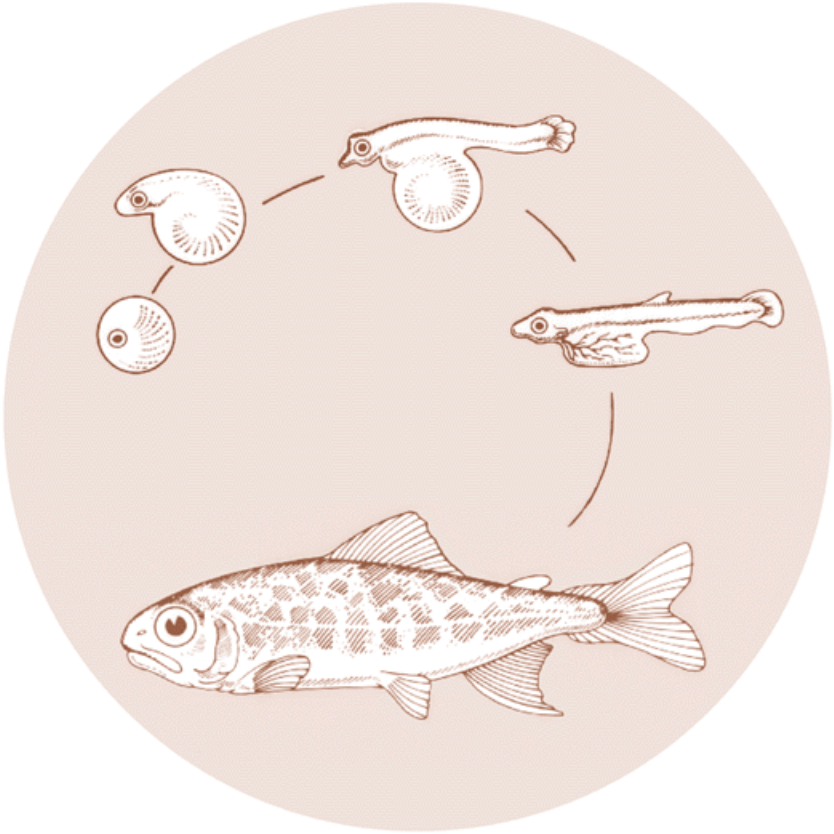
September 1995

TRAPPING AND TRANSPORTATION OF ADULT AND JUVENILE SALMON IN THE LOWER UMATILLA RIVER IN NORTHEAST OREGON

Umatilla River Basin Trap and Haul Program
October 1994 - September 1995

Annual Progress Report



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TRAPPING AND TRANSPORTATION OF ADULT AND JUVENILE SALMON IN THE LOWER UMATILLA RIVER IN NORTHEAST OREGON

UMATILLA RIVER BASIN TRAP AND HAUL PROGRAM
OCTOBER 1994 - SEPTEMBER 1995
ANNUAL PROGRESS REPORT

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ABSTRACT

Threemile Falls Dam (Threemile Dam), located near the town of Umatilla, is the major collection and counting point for adult salmonids returning to the Umatilla River. Returning salmon and steelhead were collected at Threemile Dam from August 26, 1994 to June 27, 1995. A total of 1,531 summer steelhead (Oncorhvnchus mykiss); 688 adult, 236 jack, and 368 subjack fall chinook (O. tshawvtscha); 984 adult and 62 jack coho (O. kisutch); and 388 adult and 108 jack spring chinook (O. tshawvtscha) were collected. All fish were trapped at the east bank facility.

Of the fish collected, 971 summer steelhead; 581 adult and 27 jack fall chinook; 500 adult and 22 jack coho and 363 adult and 61 jack spring chinook were hauled upstream from Threemile Dam. There were also 373 summer steelhead; 12 adult, 186 jack and 317 subjack fall chinook: 379 adult and 32 jack coho and 15 adult and one jack spring chinook released at Threemile Dam. In addition, 154 summer steelhead were hauled to Bonifer and Minthorn for brood.

The Westland Canal facility, located near the town of Echo, is the major collection point for outmigrating juvenile salmonids and steelhead kelts. The facility operated for a total of 179 days between December 2, 1994 and July 19, 1995. During that period, fish were bypassed back to the river 137 days and were trapped 42 days. Three steelhead kelts and an estimated 1,560 pounds of juvenile fish were transported from the Westland Canal trap to the Umatilla River boat ramp at rivermile (RM) 0.5. Approximately 98% of the fish transported this year were salmonids.

The Threemile Dam west bank juvenile bypass began operating March 25, 1995 and was closed on June 16, 1995. The juvenile trap was operated by Oregon Department of Fish and Wildlife (ODFW) research personnel from April 1, 1995 through the summer to monitor juvenile outmigration.

INTRODUCTION

The Confederated Tribes of the Umatilla Indian Reservation (CTUIR) and Oregon Department of Fish and Wildlife (ODFW) are cooperatively working to rehabilitate runs of coho, fall and spring chinook and summer steelhead in the Umatilla River Basin (Figure 1). Bonneville Power Administration (BPA) and other federal agencies are funding several projects to accomplish that goal (ODFW 1986). Included among these projects is the Umatilla River Trap and Haul Program (Fish and Wildlife Program measure 1403 [4.21]).

Releases of juvenile salmon and steelhead into the Umatilla River have increased from 27,000 in 1981 to a peak of 6,365,000 in 1992. An estimated 5,000,000 juvenile salmon and steelhead were released into the Umatilla River in 1995 and long range production goals call for releasing up to 8,950,000 (CTUIR and ODFW 1989). In addition to increases in artificial production, restoration and rehabilitation projects in the upper basin are expected to have a positive impact on natural production. Although adult returns to the Umatilla River in 1994-95 reached only 4,400 fish, the long range goal for the Umatilla River is for a combined, all species return of 48,000 adult salmonids (CTUIR and ODFW 1989).

The lower 30 miles of the Umatilla River provides an obstacle to migration of both adult and juvenile salmonids during low flow periods. During juvenile outmigration and adult return periods, parts of the lower river between Threemile and Stanfield dams can be dewatered, stranding migrating salmonids. Flows of 150 cfs have been hypothesized to be the minimum needed for fish passage through the lower 30 miles of river (USFWS 1981). Fish passage improvement and flow enhancement projects are intended to improve this problem. In conjunction with these passage improvement and flow enhancement projects, the Umatilla River Trap and Haul Program has been implemented to assist fish passage.

The goal of the Trap and Haul program is to maximize survival of adult and juvenile salmonids in the lower 30 miles of the Umatilla River. The two primary responsibilities of the program are: 1) to provide safe transportation around this heavily diverted stretch of river and 2) to ensure that fish passage and flow improvement projects are operated in a coordinated manner in order to facilitate adult and juvenile fish migration.

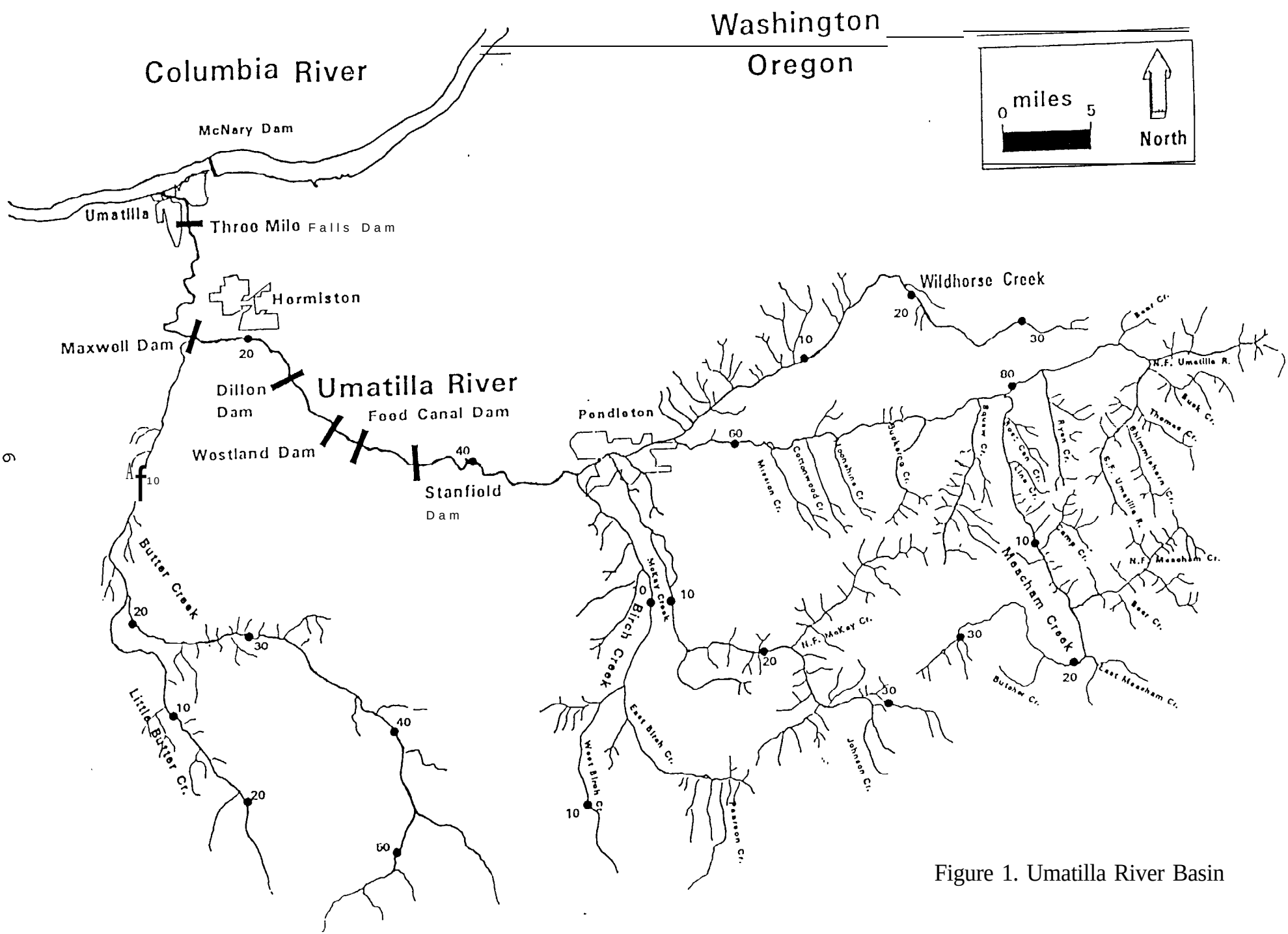

Figure 1. Umatilla River Basin

METHODS

Objective 1 - Adult Trapping and Hauling

Task 1.1 - Threemile Dam Adult Trapping

Threemile Dam, located approximately three miles upstream from the mouth of the Umatilla River, is the major collection and counting point for all adults returning to the Umatilla River. The main collection facility is located on the east bank and includes a vertical slot ladder, Denil steeppass, raceway type holding pond and fish handling and sorting complex (Figures 2 & 3). Captured adults can be directed back into the holding pond, into recovery tanks for release upstream of the dam, directly into the dam forebay or into transport tanks for hauling.

Data collected during adult trapping operations included date, number of fish trapped, species, age and sex composition, marks and disposition. Observations were also made of marine mammal damage, net marks, and general fish condition. In addition, fork length, mid-eye/hypural plate (MEHP) length, weight, scales and snouts were collected from a portion of the fish with coded wire tags (CWT).

Fall and spring chinook were classified as either adults (fork length greater than or equal to 24 inches) or jacks (fork length less than 24 inches) based on ODFW sport fishing regulations. Subjack (or mini-jack) fall chinook were defined as less than 15 inches in fork length based upon historical length frequency data (CTUIR files). Coho adults (3 years old) were defined as fork length greater than or equal to 18 inches and jacks (2 years old) as fork length less than 18 inches based upon historical length frequency data (CTUIR files). Based on scale analysis of Umatilla River summer steelhead, adult summer steelhead were classified as either one ocean (S1, fork length less than 26 inches) or two ocean (S2, fork length greater than or equal to 26 inches) (CTUIR files). Visual determinations were made to differentiate resident rainbow trout from summer steelhead (but generally less than 18 inches). No data was collected from fish designated as resident trout.

The east bank facility was to be manned 24 hours a day during the adult capture season. A trailer was provided by BPA for on-site housing. In addition to providing security, watch personnel monitored facility operations, assisted in trap and haul operations and made observations of fish activity.

The west bank at Threemile Dam also has an adult collection facility (Figure 4). It consists of a vertical slot ladder, a combination V-trap/holding pond and fish loading apparatus. The trap/holding pond and fish loading complex have no enumeration or sorting capabilities. The ladder was designed with the ability to enumerate fish using video equipment.

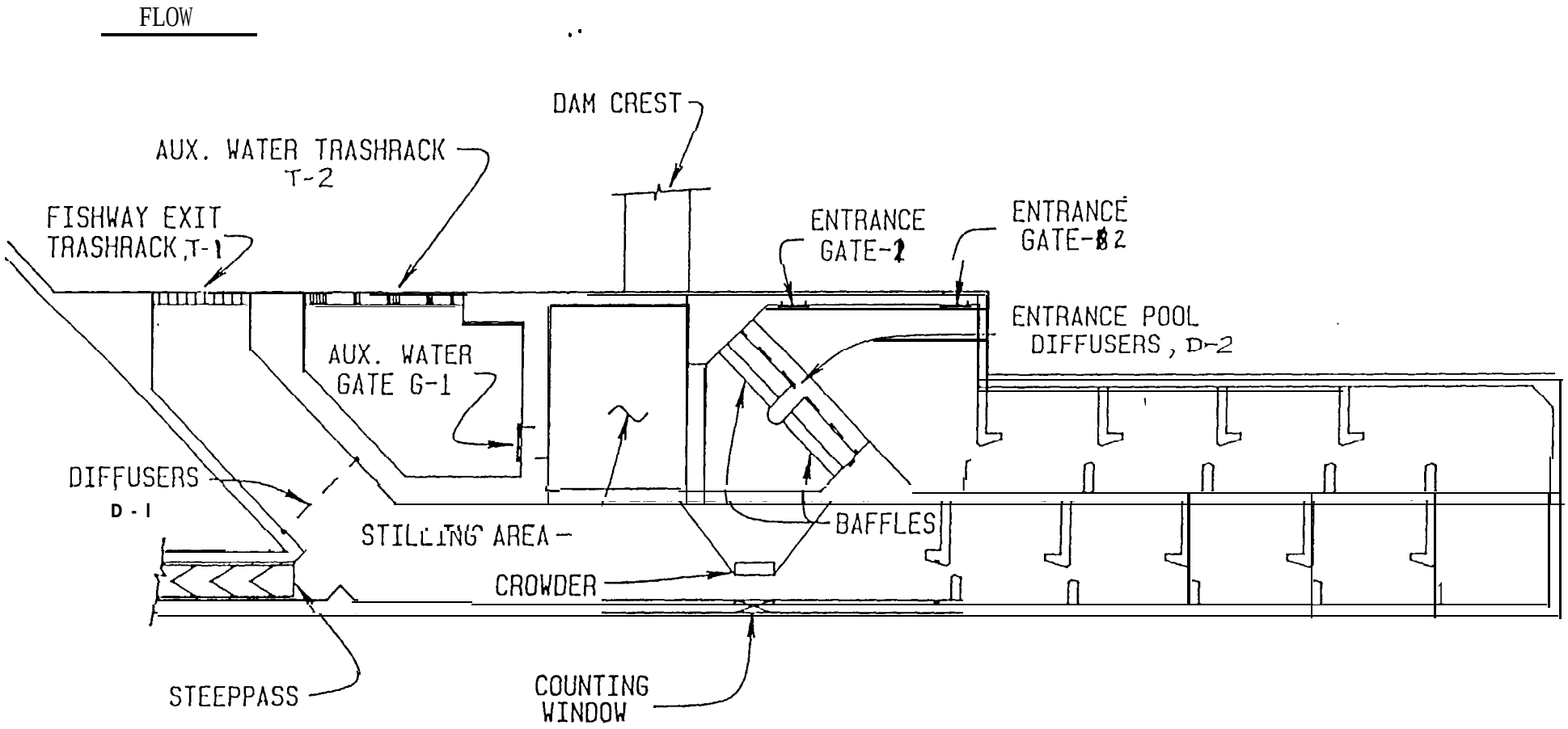

Figure 2. Threemile Dam East Bank Ladder

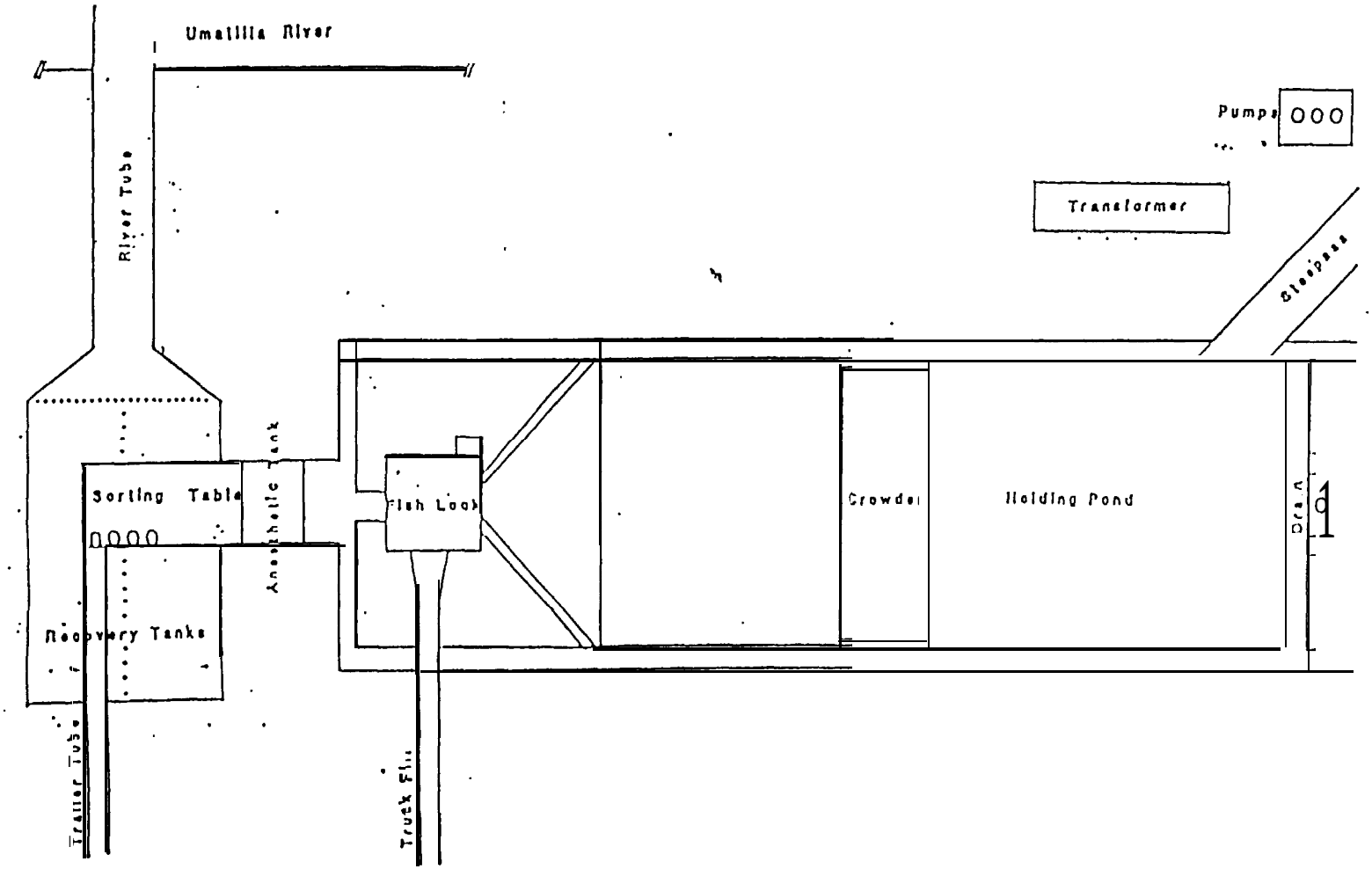

Figure 3. Threemile Dam East Bank Adult Facility

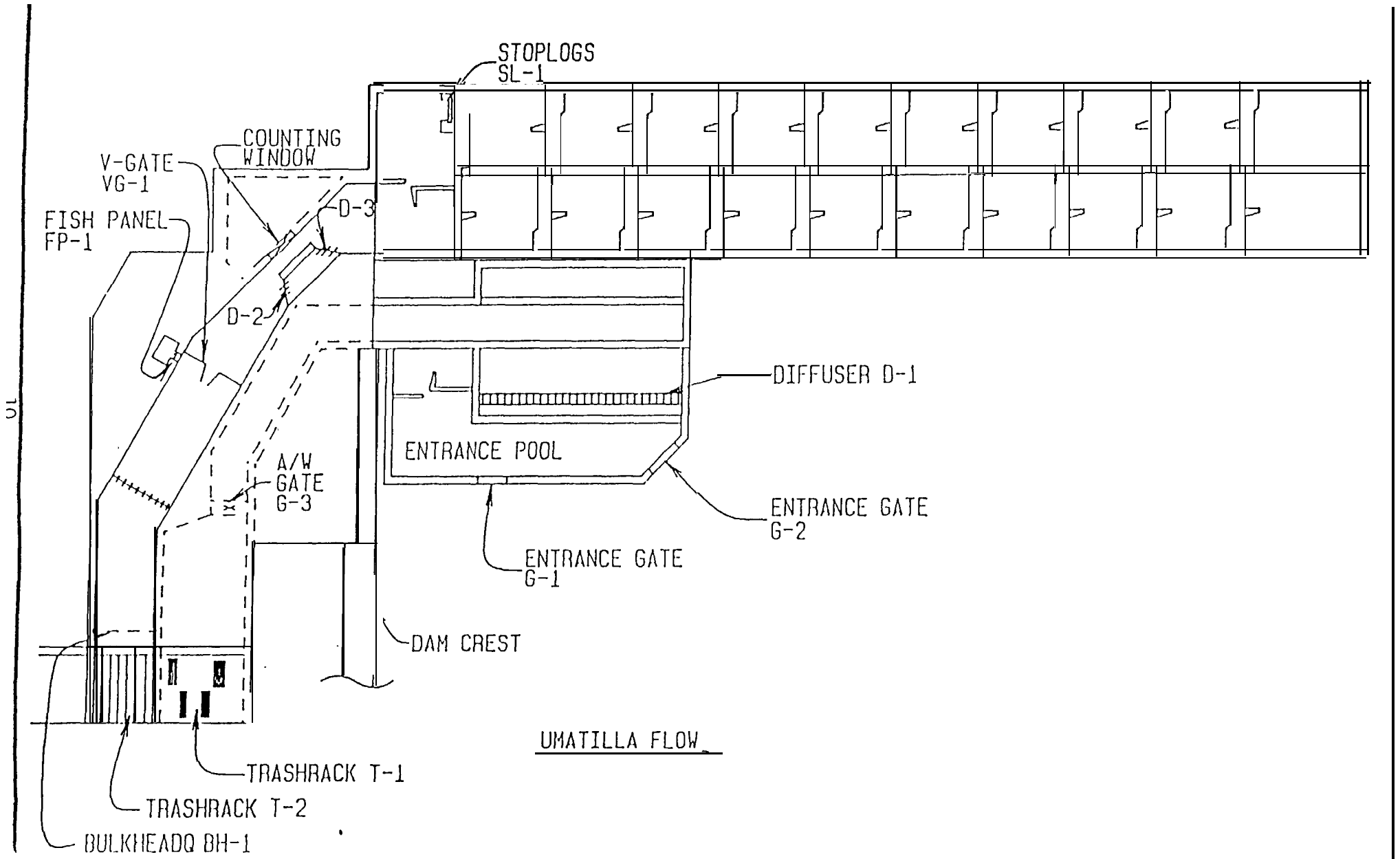

Figure 4. Threemile Dam West Bank Ladder and Adult Facility

Task 1.2 - Threemile Dam Adult Hauling

The Trap and Haul program has one 3,000 gallon and two 370 gallon fish liberation units. The 3,000 gallon unit is a diesel operated tractor-trailer equipped with a 12 inch discharge opening and two holding chambers capable of isolating two groups in the same load. The unit is also equipped with both liquid oxygen and electric aeration to reduce fish stress during transport. The two 370 gallon transport tanks are mounted on dual axle trailers and are pulled by pick-up trucks. Each unit is equipped with both compressed oxygen aeration and a re-circulation system. Both units have an eight inch discharge opening. ODFW liberation protocols were used as the basic guideline for adult hauling operations.

Adult transportation requirements were based on flow criteria outlined in the 1981 U.S. Fish and Wildlife Service study and past observations of salmon migrations in the Umatilla River. The Umatilla Hatchery and Basin Annual Operations Plan (AOP)(CTUIR and ODFW 1994) also identified criteria for transport of adults returning to Threemile Dam. Generally, returning adults were to be hauled whenever flow conditions in the Umatilla River were projected to fall below 150 cfs at Dillon (RM 24.5) within 30 days.

Trap and Haul personnel were also responsible for collection and transportation of broodstock designated for Umatilla River production.

Task 1.3 - Threemile Dam Adult Anesthesia

All returning adults captured at Threemile Dam were to be anesthetized with carbon dioxide (C02).

Task 1.4 - Adult Releases

The 1994 Umatilla AOP identified release locations for adults hauled from Threemile Dam. Fall chinook and coho hauled upstream were to be released at Barnhart (RM 42). Summer steelhead releases were to be alternated between Barnhart and Nolin (RM 33). Spring chinook and summer steelhead were to be released at Barnhart through May 15 or until flows at Pendleton (RM 54) dropped below 150 cfs. Releases were then to be alternated between Thornhollow (RM 73.5) and Imeques C-mem-ini-kern (Fred Gray's, RM 80). Spring chinook released below Pendleton were to be given a differential mark (caudal punch) to evaluate impact of release location on fallback and prespawn survival rates.

Returning adults were to be released at Threemile Dam whenever flows at Dillon were anticipated to remain above 150 cfs for a minimum of 30 days after release. However, the 1994 Umatilla AOP identified the following groups for release at Threemile Dam regardless of flow condition: fall chinook minijacks; excess fall chinook jacks: excess coho adults and jacks; and radio tagged

passage evaluation fish of all species. Fish released at Threemile Dam were to receive a caudal fin punch to identify fallbacks.

Task 1.5 - Westland Kelt Trapping and Hauling

The Westland facility, located near Echo (RM 27), is the capture point for outmigrating summer steelhead kelts. The facility is designed to either bypass kelts directly back to the river or to trap them. Kelts entering the trap are separated from juveniles by a horizontal bar grader and then proceed into an adult holding pond. Kelts can then be loaded into tanks for hauling downstream. Kelts were to be released at the Umatilla boat ramp (PM 0.5) as outlined in the 1994 Umatilla AOP.

Objective 2 - Juvenile Trapping and Hauling

Task 2.1 - Westland Juvenile Facility Operation

The Westland facility (Figure 5) is the major collection point for outmigrating juvenile salmonids. It is intended to be operated whenever Westland Canal is delivering water. The facility consists of rotary drum screens, fish bypass, fish trap, adult/juvenile separator (horizontal bar grader), and adult and juvenile holding ponds.

During periods of flow adequate for downstream migration, the facility is designed to operate in the bypass mode. In this mode, fish that enter the irrigation canal are shunted directly back to the river without entering the holding ponds. During periods of inadequate flow the facility is designed to trap fish, separate juveniles from adults, and direct them to their respective holding units. Juveniles can then be loaded onto trucks or trailers for transport downstream.

Data collected by Trap and Haul personnel at Westland included dates of operation in the bypass and trapping modes as well as date, hauling unit, number of pounds hauled and an estimate of mortality for each juvenile transport. Bonifer/Minthorn personnel collected other information related to smolt outmigration such as size and species composition.

Westland was manned on a 24 hour basis from April 1 through the end of June. A trailer was provided by BPA for on-site housing and watch personnel were involved with the same general activities as watch personnel at Threemile Dam east bank.

Task 2.2 - Westland Juvenile Hauling

A standard Neilson impellor fish pump was borrowed from Lookinglass Hatchery and stationed at Westland for loading juveniles captured at the Westland trap. In addition, there is an experimental Pescalator rotary auger pump located at the facility.

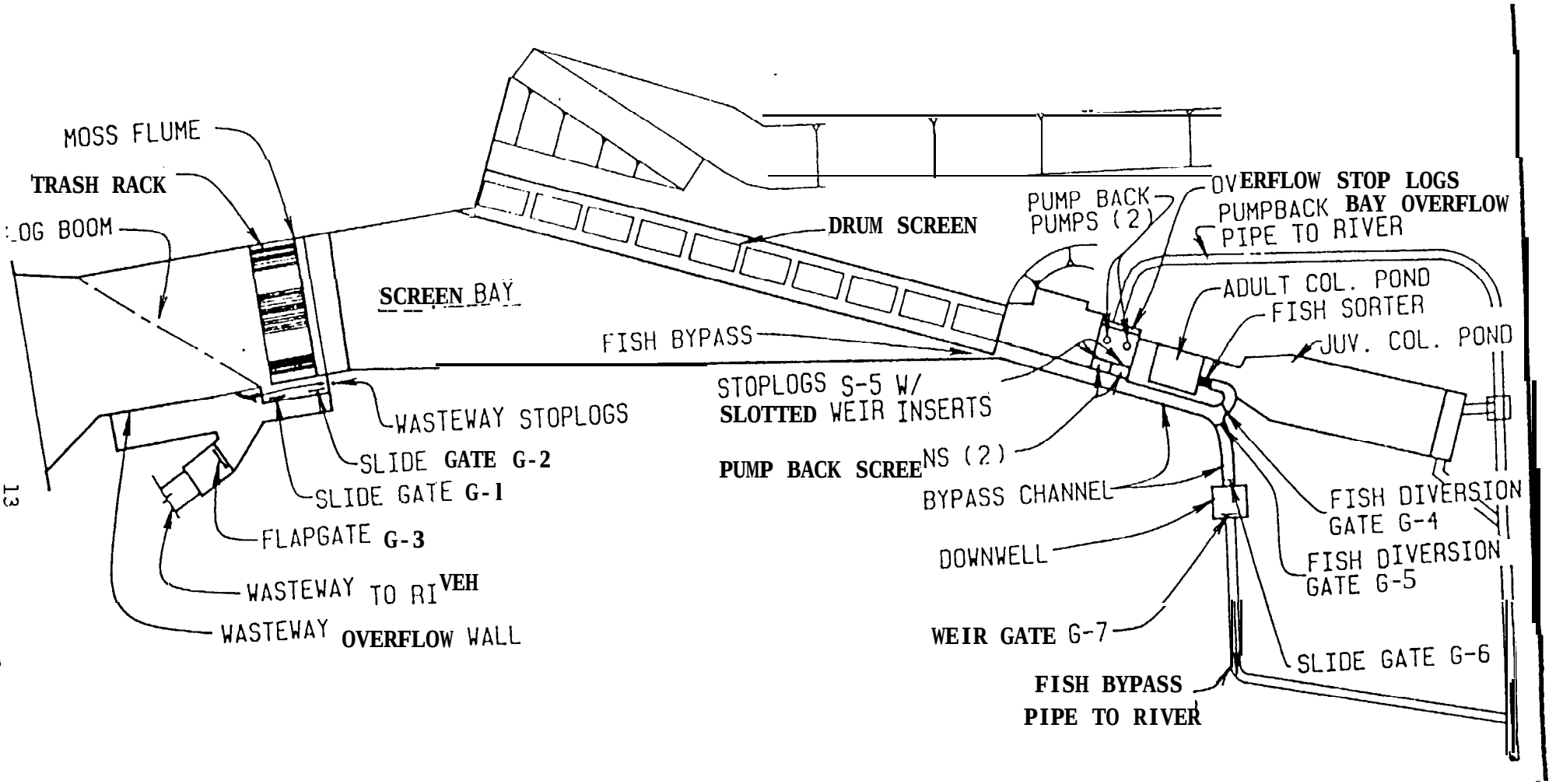

Figure 5. Westland Canal Juvenile Facility

Juvenile transportation requirements were based on flow criteria outlined in the 1981 U.S. Fish and Wildlife Service study and past observations of salmon migrations in the Umatilla River. Downstream migrants (both juveniles and kelts) were to be hauled whenever flow conditions in the Umatilla River were projected to drop below 150 cfs at Dillon within 10 days.

The same transport units used for adults are used for hauling juveniles. ODFW liberation protocols were used as a basic guideline for juvenile hauling operations.

Task 2.3 - Threemile Dam Juvenile Facility Operation

A juvenile collection facility is also located at Threemile Dam west bank (Figure 6). This facility consists of rotary drum screens, fish bypass channel, fish trap, sampling station and holding tote. It is designed to bypass outmigrating juveniles during periods of adequate flow or to trap them during low flow periods. The trapping portion of this facility was designed as a sampling and evaluation station rather than a production trap and haul facility and can be used for sampling during bypass periods.

Task 2.4 - Juvenile Releases

Juveniles were to be released at the Umatilla River boat ramp (RM 0.5) as outlined in the 1994 Umatilla AOP.

Objective 3 - Passaae Facility Monitoring

Task 3.1 - Passage Facility Inspections

Temperatures were monitored during the project year to help in establishing operating guidelines for future trap and haul operations. Temperatures were measured daily at Threemile Dam by use of a Ryan TempMentor digital recording thermometer and at loading stations and release sites with hand held thermometers.

Daily river flow was monitored at Pendleton (RM 54), Yoakum (m 37), Dillon (RM 24.5) and Umatilla (RM 2). Daily irrigation usage was monitored for Stanfield, Westland, and Feed canals. River flow and irrigation usage data was provided by Oregon Department of Water Resources (OWRD) from the Hydromet flow gauging stations.

Juvenile fish screens and adult ladder facilities, located at five major irrigation diversions and at seven smaller diversions, were monitored on a weekly basis throughout the year to ensure adequate passage conditions for both upstream and downstream migrants. Inspections included checking for proper installation and operation of drum screens, gaps and holes in drum screens and seals, debris accumulation on drum screens and trash racks, proper flows and access to both smolt bypasses and adult ladders, and signs of fish activity.

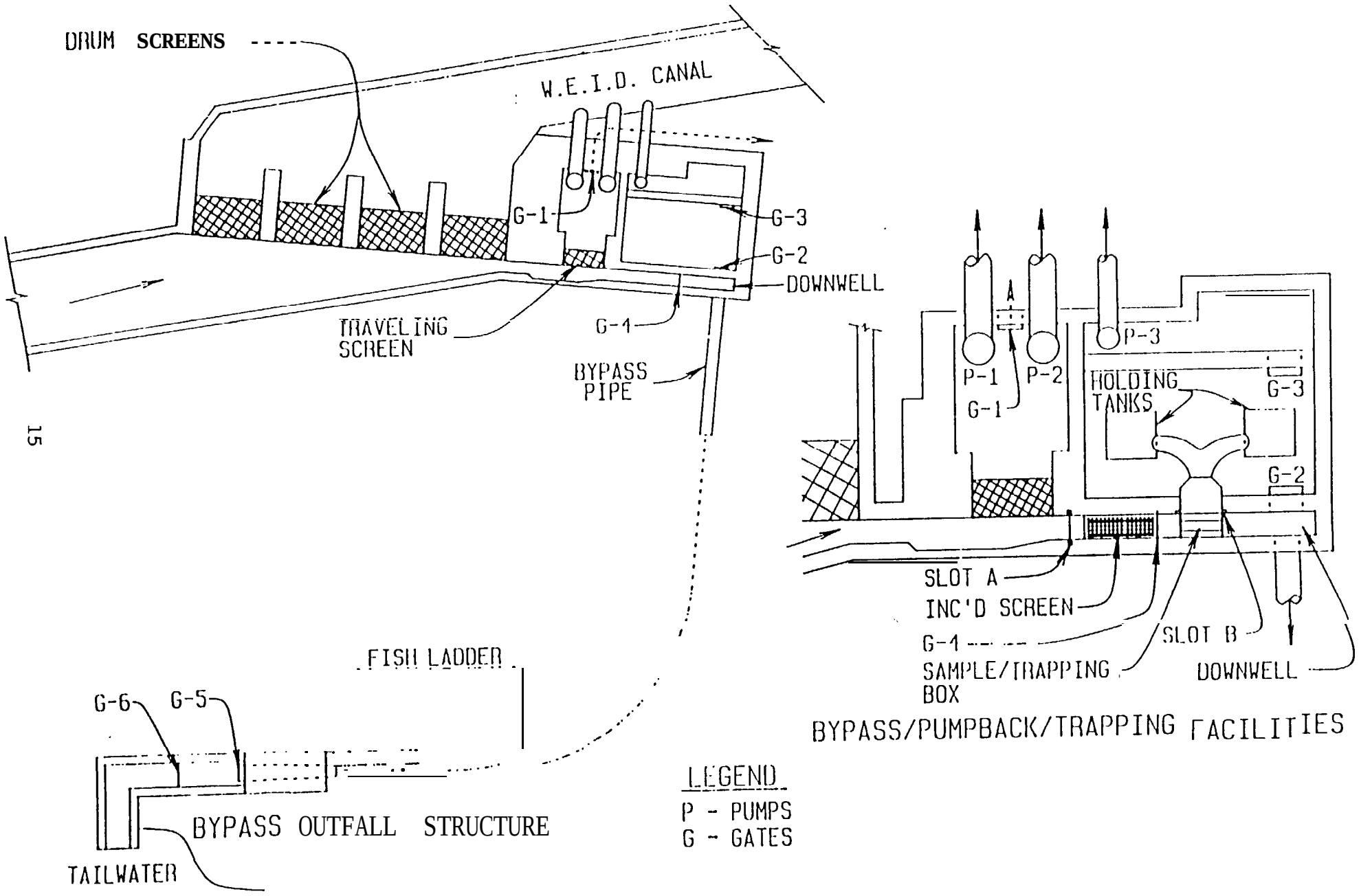

Figure 6. Threemile Dam West Bank Juvenile Facility

RESULTS

Objective 1 - Adult Trapping and Haulin

Task 1.1 - Threemile Dam Adult Trapping

Threemile Dam east bank ladder opened on August 22, 1994 and the steeppass and trap were opened on October 4. The ladder and adult facility ran continuously, with a few exceptions, until June 30, 1995. The ladder was closed for seven days in March and briefly on three other occasions in February because of heavy silt loads and debris accumulation. The adult facility was closed for five days in January, seven days in February, eight days in March, and 14 days in May. A number of high flow events this year, carrying large amounts of silt and debris, were the primary reason for the facility closures. In addition, there were some mechanical problems with the pump system this spring.

The first returning salmon and steelhead were collected on August 26. A total of 1,531 summer steelhead; 688 adult, 236 jack and 368 subjack fall chinook: 984 adult and 62 jack coho; and 388 adult and 108 jack spring chinook were collected at Threemile Dam. Included in the spring chinook jack total were 26 fish which were less than 15 inches in length. All fish were trapped at the east bank facility, the west bank facility was not operated this year.

Summer steelhead were trapped from September 26, 1994 to June 22, 1995. Peak return occurred during February when 25.0% (383 of 1,531 fish) of the fish were trapped. Based on historical fork length data, 55.5% of the summer steelhead run was comprised of Sl fish and 44.5% were S2 fish.

Coho were trapped from September 23 to December 5, 1994. Peak return month for both adults and jacks was October. Of the total coho return, 85.7% (843 of 984 fish) of the adults and 72.6% (45 of 62 fish) of the jacks were trapped in October.

Fall chinook were trapped from August 26 to November 29, 1994. Peak return month for adults, jacks and subjacks was October. Of the total fall chinook return, 81.1% (558 of 688 fish) of the adults, 84.8% (200 of 236 fish) of the jacks, and 81.3% (299 of 368 fish) of the subjacks were trapped in October.

Spring chinook were captured from March 29 to June 27, 1995. Peak return month for both adults and jacks was May. Of the total spring chinook return, 70.1% (272 of 388 fish) of the adults and 65.7% (71 of 108 fish) of the jacks were trapped in May. Of the true jacks, 86.6% of the total returned in May (71 of 82 fish). All jacks less than 15 inches in length (mini-jacks) returned in June.

There were also seven spring chinook and five summer steelhead fallbacks (caudal punched) recovered at Threemile Dam. One of the

spring chinook and two of the steelhead were radio tagged. All fallbacks were hauled upriver for release but were not re-recorded in the daily return summaries. Tables 1 through 4 contain a complete daily record of adults captured during 1994-95 including date, age class, marks, and disposition.

In addition to capturing adult salmonids, thousands of non-game fish were collected at the east bank facility during the trapping season. Major species collected were northern squawfish (Ptychocheilus oresonensis), chiselmouth (Acrocheilus alutaceus), large scale sucker (Catostomus macrocheilus) and bridgelip sucker (C. columbianus). Squawfish were sacrificed; all other non-game fish were released upstream of the dam. Juvenile salmonids and rainbow trout also entered the adult trap and were released back to the river. Other species encountered at Threemile Dam were bull trout (Salvelinus confluentus), whitefish (Prosopium williamsoni), pacific lamprey (Entosnhenus tridentatus), carp (Cynrinus carpio), black crappie (Pomoxis nisromaculatus), and smallmouth bass (Microoterus dolomieui).

Task 1.2 - Threemile Dam Adult Hauling

Of the fish trapped at Threemile Dam, 971 summer steelhead; 581 adult and 27 jack fall chinook; 500 adult and 22 jack coho; and 363 adult and 61 jack spring chinook were hauled upstream. There were also 154 summer steelhead hauled for brood. No fall chinook, spring chinook, or coho were collected for broodstock this year. A total of 159 loads of fish were transported from Threemile Dam on 135 days. The 3,000 gallon liberation unit was used for 62 trips and one of the 370 gallon units was used for 97 trips. No double release site trips were made with the tanker this year.

Summer steelhead adults were hauled upstream from Threemile Dam 86 days between September 26, 1994 and June 22, 1995. There were also 32 trips made to the Minthorn and Bonifer holding ponds with broodstock between October 13 and April 20. Fall chinook were hauled upstream from Threemile Dam 37 days between August 29 and November 16, 1994. Coho were hauled upstream from Threemile Dam 27 days between October 9 and November 14, 1994. Spring chinook were hauled upstream from Threemile Dam 44 days between March 29 and June 26, 1995.

Fish condition at release generally appeared good this year, only six adult mortalities were observed upon release. Adult hauling information, including dates, temperatures, liberation units used and release sites is included in Appendix A.

Task 1.3 - Threemile Dam Adult Anesthesia

Adults were trapped in the Threemile Dam east bank ladder using a V-trap from August 26 through October 4 when the adult facility was opened. None of the adults trapped in the ladder were

Table 1 1994 Fall Chinook Return Disposition

DATE	TRAPPED				SACRIFICED				RELEASED UPSTREAM			RELEASED@ DAM			
	TOTAL	ADUTS	JACKS	SUBJACKS	TOTAL	ADUTS	JACKS	SUBJACKS	TOTAL	ADUTS	JACKS	TOTAL	ADULTS	JACKS	SUBJACKS
8-26	2	0	1	1	0			1	0		1	2		1	1
e-29	2	2	0	0	0			1	2	2	1	0			
AUG	4	2	1	1	0	0	0	0	2	2	0	2	0	1	1
9-06	2	0	1	1	0				0			2		1	1
9-13	1	1	0	0	0				1	1		0			
S-14	1	0	1	0	0				0			1		1	
S-15		0	0	1	0				0			1			1
9-19	5	3	1	1	0				3	3		2		1	1
9 - M	0	0	0	0	0				0			0			
S-21	1	0	0	1	1			1	0			0			
9-26	5	5	0	0	0				5	5		0			
9-2s	3	0	1	2	1			1	0			2		1	1
S-30	2	0	0	2	2			a	0			0			
SEP	21	9	4	6	4	0	0	4	9	9	0	8	0	4	4
10-03	3	0	0	3	0				0			3			3
10-04	3	0	1	2	0				0			3		1	3
IO-05	5	2	0	3	0				2	2		3			3
10-06	10	0	3	7	1			1	0			9		3	6
IO-07	3	1	1	1	0				1	1		2		1	1
10-09	37	14	6	17	1			1	14	14		22		6	16
IO-10	36	9	13	14	4	2	2		9	7	2	23		9	14
IO-11	a7	50	16	21	10	7	1	2	46	43	3	31		12	19
IO-12	275	216	38	21	34	29	5		189	184	5	52	3	26	21
10-13	55	12	14	29	8		3	5	11	IO	1	36	2	10	24
10-14	40	9	7	24	9	2		7	6	6		25	1	7	17
10-16	43	11	12	20	0				11	11		32		12	20
10-17	21	5	3	13	3	1		2	4	3	1	14	1	2	11
IO-IS	15	1	1	13	2		1	1	1	1		12			12
IO-IS	18	5	3	10	3		2	1	5	5		10		1	9
10-20	7	3	1		0				2	2		5	1	1	3
IO-21	14	7	0	:	3	1		2	6	6		5			5
to-22	39	20	11	8	0				21	19	2	18	1	9	8
IO-23	24	IO	3	11	0				10	10		14		3	11
IO-24	35	15	5	15	19	11	2	6	4	4		12		3	9
10-2s	8	0	1	7	0				0			8		1	7
10-26	5	0	1	4	0				0			5		1	4
IO-27	11	0	3	a	2			2	0			9		3	6
IO-26	16	6	5	5	0				6	6		10		5	5
IO-29	59	35	18	6	0				37	35	2	22		16	6
10-30	55	43	9	3	0				43	43		12		9	3
10-31	133	84	25	24	30	21	3	6	68	63	5	35		17	18
OCT	1057	558	200	299	129	74	19	36	496	475	21	432	9	160	263
11-01	35	13	6	16	5	2	1	2	12	11	1	18		4	14
11-02	17	a	1	8	2	1		1	7	7		a		1	7
11-03	12	4	2	6	1	1			4	3	1	7		1	6
11-04	10	4		5	1				4	4		5		1	4
11-06	17	5	4	a	0				5	5		12		4	8
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11-22	1	1	0	0	0				0			1	1		
11-28	2	1	1	0	0				0			2	1	1	
11-29	1	1	0	0	1	1			0			0			
NOV	210	119	31	60	36	21	4	11	101	95	6	73	3	21	49
TOTAL	1292	688	236	368	169	95	23	51	608	581	27	515	12	186	317

ole 2. 1994 Coho Return Disposition

DATE	TRAPPED TOTAL	TRAPPED ADULTS	TRAPPED JACKS	SACRIFICED TOTAL	SACRIFICED ADULTS	SACRIFICED JACKS	RELEASED UPSTREAM TOTAL	RELEASED UPSTREAM ADULTS	RELEASED UPSTREAM JACKS	RELEASED @ DAM TOTAL	RELEASED @ DAM ADULTS	RELEASED @ DAM JACKS
9-23	1	0	1	0			0			1		1
9-27	1	0	1	0			0			1		1
9-30	1	1	0	0			0			1	1	
SEP	3	1	2	0	0	0	0	0	0	3	1	2
IO-04	1	0	1	0			0			1		1
IO-06	2	0	2	0			0			2		2
IO-09	12	7	5	2	1	1	7	6	1	3		3
IO-10	3	1	2	1		1	1	1		1		
IO-11	4	2	2	1		1	3	2	1	0		
IO-12	25	23	2	3	2	1	19	19		3	2	1
IO-13	6	6	2	1		1	4	4		3	2	1
10-14	7	3	4	0			2	2		5	1	4
10-16	7	5	2	0			5	5		2		2
10-17	12	9	3	3	2	1	6	6		3	1	2
10-18	8	5	3	0			6	5	1	2		2
IO-19	6	5	3	1			5	5		2		2
IO-20	6	6	0	1	1		4	4		1	1	
IO-21	23	22	1	2	2		9	9		12	11	1
IO-22	65	65	0	0			52	52		33	33	
10-23	29	26	3	0			26	26		3		3
10-24	27	26	1	10	17		9	9		0		
10-25	5	5	0	2	2		3	3		0		
10-26	6	5	1	3	3		2	1	1	1	1	
10-27	13	13	0	4	4		9	9		0		
10-28	19	19	0	0			19	19		0		
IO-29	252	252	0	0			175	175		77	77	
IO-30	157	152	5	0			142	136	4	15	14	
10-31	169	166	3	71	71		3		.	95	95	
OCT	666	643	45	113	105	4	511	500	11	264	236	26
11-01	14	12	2	0			2		2	12	12	
11-02	11	7	4	0			4		4	7	7	
11-03	16	17	1	0			1			17	17	
11-04	21	21	0	0			0			21	21	
11-06	10	10	0	0			0			10	10	
11-07	2	2	0	0			0			2	2	
11-09	3	1	2	0			2			1	1	
11-10	4	4	0	0			0			4	4	
11-11	12	12	0	0			0			12	12	
11-14	45	43	2	0			2			43	43	
11-15	2	2	0	0			0			2	2	
11-16	2	2	0	0			0			2	2	
11-17	2	1	1	0			0			2	1	
11-21	2	2	0							2	2	
NOV	146	136	12	0	0		11	0	1	137	136	
12-02	4	1		0			0			4	1	
12-05				0			0			3	3	
DEC	7	4		0	0		0	0		7	4	
TOTAL	1046	964	6:	113	105		522	500	2	411	379	3'

Table 3. 1994 –95 Summer Steelhead Return Disposition

DATE	TRAPPED TOTAL	TRAPPED HATCHERY	TRAPPED WILD	SACRIFICED TOTAL	SACRIFICED HATCHERY	SACRIFICED WILD	RELEASED UPSTREAM TOTAL	RELEASED UPSTREAM HATCHERY	RELEASED UPSTREAM WILD	RELEASED @ DAM TOTAL	RELEASED @ DAM HATCHERY	RELEASED @ DAM WILD	BROOD TOTAL	BROOD HATCHERY	BROOD WILD
9–26	1	0	1	0			1		1	0			0		
SEP	1	0	1	0	0	0	1	0	1	0	0	0	0	0	0
0–07	1	0	1	0			.		.	0			0		
0-0S	8	3	5	0			8	3	5	0			0		
0– 10	3	2	1	0			3	2	1	0			0		
IO-12	3	1	2	0			3	1	2	0			0		
IO-13	1	0	1	0			C			0			1		1
0-16	2	1	1	0			2	1	1	0			0		
IO-17	1	1	0	0			1	1		0			0		
IO-IS	1	1	0	0			1	1		0			0		
IO-21	1	1	0	1	1		0			0			0		
IO-25	1	0	1	0			1		1	0			0		
IO-29	9	3	6	0			9	3	6	0			0		
IO-30	a	1	7	0			8	1	7	0			0		
10–31	21	9	12	0			13	4	9	1	1		7	4	3
OCT	60	23	37	1	1	0	50	17	33	1	1	0	8	4	4
11–01	4	3	1	0			4	3	1	0			0		
11–02	6	3	3	0			6	3	3	0			0		
11–03	5	1	4	0			5	1	4	0			0		
II-04	6	6	0	2	2		4	4		0			0		
11-07	4	3	1	0			4	3	1	0			0		
11–10	2	1	1	0			1		1	1	1		0		
11-11	4	1	3	0			4	1	3	0			0		
11-14	54	IS	35	5	5		49	14	35	0			0		
II-15	3	1	2	0			3	1	2	0			0		
11-16	7	7	0	0			3	3		0			4	4	
II-17	5	3	2	1	1		0			1	1		3	1	2
11–21	2	1	1	0			0			1	1		1		1
11–23	1	1	0	0			0			1	1		0		
11-26	5	3	2	0			0			3	3		2		2
11-2s	1	1	0	0			0			0			1	1	
11–30	2	0	2	0			0			2		2	0		
NOV	111	54	57	a	8	0	83	33	50	9	7	2	11	6	5
1 2 - M	4	2	2	0			0			3	2	1	1		1
12–05	13	3	10	0			0			13	3	10	0		
12-06	5	2	3	0			0			5	2	3	0		
12–08	2	0	2	0			0			2		2	0		
12-12	11	6	5	0			0			11	6	5	0		
12-13	5	1	4	0			0			5	1	4	0		
12–14	15	4	11	0			0			12	3	9	3	1	2
12-15	2	1	1	1	1		0			1		1	0		
12-16	1	1	0	0			0			1	1		0		
12-18	31	9	22	0			0			31	9	22	0		
12-1s	12	a	4	3	3		0			1		1	8	5	3
12–20	3	0	3	0			0			3		3	0		
12-21	29	6	23	0			0			29	6	23	0		
12-22	56	15	41	0			0			47	11	36	9	4	5
12-23	44	17	27	0			0			32	11	21	12	6	6
12-24	18	7	11	0			0			18	7	11	0		
12-27	27	16	11	9	9		0			14	5	9	4	2	2
12–28	19	7	12	0			0			19	7	12	0		
12-30	1	0	1	0			0			1		1	0		
DEC	298	105	193	13	13	(	0	0	C	246	74	174	37	18	1s
1–10	1	0	1	0			0			1		1	0		
I-13	3	0	3	0			0			3		3	0		
1-14	6	3	3	0			0			6	3	3	0		
I-16	7	4		0			0			7	4	3	0		
1-19	17	2	1:	0			0			17	2	15	0		
1 - M	23	6	17	0			0			12	3	9	11	3	8
1-22	22	6	16	0			0			22	6	16	0		
1-23	6	3	:	0			0			4	1	3	2	2	
1-24	3	0	:	0			0			3		3	0		
1-25	5	2		0			0			4	1	3	1	1	
1-26	8	4	4	0			0			a	4	4	0		
1-27	9	4		0			0			9	4	5	0		
1–28	33	7	2(	0			33	7	2(	0			0		
1–29	36	8	3(	0			38	8	3(	0			0		
1-30	36	17	1!	0			20	7	1:	0			16	10	6
I-31	37	15	2:	0			23	9	1.	0			14	6	8
JAN	254	81	17:	0	0		114	31	8:	96	26	68	44	22	2:

Table 3. (continued)

DATE	TRAPPED TOTAL	TRAPPED HATCHERY	TRAPPED WILD	SACRIFICED TOTAL	SACRIFICED HATCHERY	SACRIFICED WILD	RELEASED UPSTREAM TOTAL	RELEASED UPSTREAM HATCHERY	RELEASED UPSTREAM WILD	RELEASED @ DAM TOTAL	RELEASED @ DAM HATCHERY	RELEASED @ DAM WILD	BROOD TOTAL	BROOD HATCHERY	BROOD WILD
2-m	16	7	9	0			16	7	9	0			0		
2-07	23	12	11	0			23	12	11	0			0		
2-08	16	10	6	0			18	10	6	0			0		
			12	0			26	16	12	0			0		
2-09	32	10	22	0			32	10	22	0			0		
2-12	39	23	16	0			39	23	16	0			0		
2-13	19	14	5	6	8		4	2	2	0			7	4	3
2-17	9	4	5	0			9	4	5	0			0		
2-19	51	16	33	0			51	16	33	0			0		
2-23	12	5	7	2	2		8	1	7	0			2	2	
2-24	12	3	9	0			10	3	7	0			2		2
2-25	38	20	16	0			38	20	18	0			0		
2-26	56	35	23	0			56	35	23	0			0		
2-27	21	5	16	0			8	4	4	1		1	12	1	11
2-28	7	2	5	0			7	2	5	0			0		
FES	383	184	199	10	10	0	349	167	162	1	0	1	23	7	16
3-01	3	2	1	0			3	2	1	0			0		
3-3-06	28	14	14	1			18	7	12	2	2		2		2
								2	4	2	2		0		
3-08	3	1	2	0			2		2	0			1	1	
3-09	5	2	3	0			5	2	3	0			0		
3-10	17	8	9	0			17	8	9	0			0		
3-12	45	26	19	0			45	26	19	0			0		
3-13	23	8	15	0			13	4	9	1	1		9	3	
3-14	15	8	7	0									0		
3-15	18	6	12	0			14	7	7	2	1	1	0		
3-23	10	4	6	0				3	6	1	1	1	0		
3-24	26	17	9	0			19	13	6	0			7	4	3
3-26	24	11	13	0			24	11	13	0			0		
3-27	26	13	13	0			22	12	10	1		1	3	1	2
3-28	16	7	9	0			14	5	9	2	2		0		
3-29	14	7	7	0			14	7	7	0			0		
3-30	12	4	6	0			10	4	6	2		2	0		
3-31	6	4	2	1	1		5	3	2	0			0		
MAR	295	141	154	1	1	0	256	121	137	14	10	4	22	9	13
4 - w	14	9	5	0			13	9	4	0			1		1
4-04	5	3	2	0			4	2	2	1	1		0		
4-05	1	0	1	0			1		1	0			0		
4-06	4	2	2	0			2	1	1	1	1		1		1
4-07	8	3	5	0			7	2	5	1	1		0		
4-09	16	11	5	0			16	11	5	0			0		
4-10	13	7	6	0			9	6	3	0			4	1	3
4-11	6	1	5	0			6	1	5	0			0		
4-12	6	3	3	0			6	3	3	0			0		
4-13	6	4	2	0			5	3	2	0			1	1	
4-14	6	6	0	0			6	6		0			0		
4-17	18	10	8	0			18	10	8	0			0		
4-18	2	0	2	0			2		2	0			0		
4-19	1	0	1	0			1		1	0			0		
4-20	3	1	2	0			1	1		0			2		2
4-21	1	0	1	0			0			1		1	0		
4-24	3	1	2	0			3	1	2	0			0		
4-27	1	0	1	0			1		1	0			0		
APR	114	61	53	0	0	0	101	56	45	4	3	1	9	2	7
5-15	1	1	0	0			1	1		0			0		
5-16	4	1	3	0			4	1	3	0			0		
5-17	3	1	2	0			3	1	2	0			0		
5-16	1	0	1	0			1		1	0			0		
5-20	1	0	1	0			1		1	0			0		
5-22	1	1	0	0			1	1		0			0		
5-25	2	1	1	0			2	1	1	0			0		
MAY	13	5	8	0	0	0	13	5	8	0	0	0	0	0	0
6-09	1	1	0	0			1	1		0			0		
6-22	1	1	0	0			1	1		0			0		
JUN	2	2	0	0	0	0	2	2	0	0	0	0	0	0	0
T	1501	656	T 875	33A	33	L 0	971	- 432	539	373	123	250	154	68	86

Table 4. 1995 Spring Chinook Return Disposition

DATE	TRAPPED TOTAL	TRAPPED ADULTS	TRAPPED JACKS	SACRIFICED/MORTALITIES TOTAL	SACRIFICED/MORTALITIES ADULTS	SACRIFICED/MORTALITIES JACKS	RELEASED UPSTREAM TOTAL	RELEASED UPSTREAM ADULTS	RELEASED UPSTREAM JACKS	RELEASED @ DAM TOTAL	RELEASED @ DAM ADULTS	RELEASED @ DAM JACKS
3-29	1	1	0	0			1	1		0		
MAR	1	1	0	0	0	n	1	1	0	0	0	0
4-03	1	1	0				1	1		0		
4-07	1	1	0	0			1	1		0		
4-09	3	3	0	0			3	3		0		
4-10	1	1	0	0			0			1	1	
4-11	2	2	0	0			0			2	2	
4-12	1	1	0	0			1	1		0		
4-13	2	2	0	0			0			2	2	
4-14	4	4	0	0			3	3		1	1	
4-17	10	10	0	0			10	10		0		
4-16	7	7	0	1	1		5	5		1	1	
4-19	6	6	0	0			5	5		1	1	
4-20	9	9	0	0			7	7		2	2	
4-21	11	11	0	0			10	10		1	1	
4-22	5	5	0	0			5	5		0		
4-23	2	2	0	0			2	2		0		
4-24	7	7	0	0			5	5		2	2	
4-25	5	5	0	0			5	5		0		
4-26	2	2	0	0			0			2	2	
4-27	8	8	0	0			8	8		0		
4-28	9	9	0	9	9		0			0		
APR	96	96	0	10	10	0	71	71	0	15	15	a
5-15	4	4	a	0			4	4		0		
5-16	46	44	2	0			46	44	2	0		
5-17	76	69	7	1		1	75	69	6	0		
5-16	81	70	11	4		4	77	70	7	0		
5-19	31	24	7	0			31	24	7	0		
5-20	31	23	8	0			31	23	8	0		
5-21	21	17	4	0			21	17	4	0		
5-22	14	4	10	7		7	7	4	3	0		
5-23	6	4	2	1			5	4	1	0		
5-24	13	8	5	0			13	8		0		
5-25	8	1	7	2		2	6	1		0		
5-26	3	0		2		2	1		1	0		
5-28	3	2	1	0			3	2	1	0		
5-30	5	2	:	1			4	2	2	0		
5-31	1	0	1	1			0			0		
MAY	343	272	71	19	0	19	324	272	52	0	0	0
6-01	1	0	1	0			1			0		
6-02	2	1	1	0			2	1		0		
6-05	2	0	2	0			2		:	0		
6-06	5	2	3	3			2	2		0		
6-07	5	4		0			5	4		0		
6-08	1	1	(	0			1	1		0		
6-09	1	0		0			1			0		
6-11	3	3	(	0			3	3		0		
6-13	2	2	(	0			2	2		0		
6-15	1	1	(	0			1	1		0		
6-16	2	1		0			2	1		0		
6-19	1	0		1			0			0		
6-22	1	1	(	0			1	1		0		
6-23	14	1	1:	11		1	3	1	2	0		
6-26	13	2	1'	10		1(	2	2		1		
6-27	2	0					0			0		
JUN	56	19	3:	27	0	2'	28	19	(	1	0	
TOTAL	496	366	10	56	10	4	424	363	6'	16	15	

*** The fo ving number of fish recorded as ja s in the summary table were actua mini-jacks by size (< 15"):
6-06 (1), 6-16 (1), 6-23 (11), 6-26 (11), 6-27 (2)

anesthetized. All adults captured after October 4 were handled through the adult facility and were anesthetized with C02.

Task 1.4 - Adult Releases

Four upriver release sites were used during the 1994-95 season: Nolin (RM 33), Barnhart (RM 42) Thornhollow (RM-73.5), and Imegues C-mem-ini-kern (Fred Gray's - RM 80). Barnhart was the major release site used again this year. All but two of the fall chinook, all the coho and approximately 77% of the summer steelhead hauled upstream were released at Barnhart. About 18% of the spring chinook were also released at Barnhart. Adult spring chinook release criteria called for fish to be released at Barnhart until either May 15 or flows at Pendleton dropped below 150 cfs. Flows remained above 150 cfs throughout the spring and adults were transported to Barnhart through May 15 and then hauled to either Thornhollow or Imegues C-mem-ini-kern beginning May 16.

All spring chinook released below Pendleton were marked with a caudal punch so that effects of release location on prespawning survival, fallback rate, and distribution could be evaluated. Data will not be available until after the spawning season and will be included in the CTUIR Umatilla Basin Natural Production Monitoring and Evaluation (UBNPME) annual report.

There were also 373 summer steelhead; 12 adult, 186 jack and 317 subjack fall chinook: 379 adult and 32 jack coho; and 15 adult and one jack spring chinook released into the forebay at Threemile Dam. All were caudal punched to identify fallbacks. Some spring chinook and steelhead adults were released at Threemile Dam at flows outside the established criteria as part of the CTUIR Adult Passage Evaluation. These fish were also caudal punched for fallback identification. In addition, spring chinook and steelhead adults were radio tagged to assess their movements following transport. Data and analysis from the Adult Passage study will also be included in the UBNPME annual report.

Summer steelhead adults were released upstream from Threemile Dam 86 days between September 26, 1994 and June 22, 1995 and at Threemile Dam on 52 days between October 31 and April 21. Fall chinook were released upstream from Threemile Dam 37 days between August 29 and November 16, 1994 and at Threemile Dam on 47 days between August 26 and November 28. Coho were released upstream from Threemile Dam 27 days between October 9 and November 14, 1994 and at Threemile Dam on 38 days between September 23 and December 5. Spring chinook were released upstream from Threemile Dam 44 days between March 29 and June 26, 1995 and at Threemile Dam on 11 days between April 10 and June 26. Table 5 includes release locations and numbers by species.

Table 5. Number of trips and adult fish hauled to each release site on the Umatilla River in 1994–95.

Thru end of May only Release Site	Total Trips Made	Total Fish Released	Summer Steelhead Released	Spring Chinook Released	Fall Chinook Released	Coho Released
Nolin	13	213	211	0	2	0
Barnhart	87	1951	746	76	606	523
Thornhollow	11	195	7	188	0	0
Imeques C–mem–ini–kum	16	167	7	160	0	0
Minthorn Brood Pond	15	50	50	0	0	0
Bonifer Brood Pond	17	104	104	0	0	0
Threemile Dam Forebay	NA	1314	373	16	515	410
Total	159	3994	1498	440	1123	933

Task 1.5 - Westland Kelt Trapping and Hauling

Three summer steelhead kelts were hauled from Westland and released at the Umatilla River boat ramp. Two adult and one jack spring chinook fallbacks were also recovered at westland. One adult was hauled upriver, the other adult and jack were mortalities.

Objective 2 - Juvenile Trapning and Hauling

Task 2.1 - Westland Juvenile Facility Operation

The Westland Canal juvenile facility was in operation for a total of 179 days between December 2, 1994 and July 19, 1995. It was operated in the bypass mode for 137 days and in the trapping mode for 42 days.

Westland Canal switched from winter recharge operations to irrigation delivery on April 6. River flow levels were adequate to continue operation of the ladder and bypass for downstream migration through May 25. On May 26 the ladder and juvenile bypass were closed due to low flows. Few downstream migrants were present during this period and all were blocked at Westland in anticipation of McKay Reservoir water releases beginning May 31. The juvenile bypass was re-opened on June 1 in conjunction with arrival of the fish passage water. Water releases were discontinued on June 7 and trapping began at the facility on June 8. Trap and haul operations continued for the remainder of the outmigration season until the facility was closed on July 19.

High flows throughout the spring and release of McKay water for juvenile fish passage during the fall chinook subyearling outmigration resulted in a low number of juvenile salmonids being captured at the Westland facility this year. A few hatchery rainbow trout "legals" were captured for the first time this year. Small numbers of non-game and warmwater fish were also collected at Westland, including northern squawfish, chiselmouth, large scale sucker, bridgelip sucker, redside shiner (Richardsonius balteatus), black crappie, whitefish, and yellow perch (Perca flavescens).

Task 2.2 - Westland Juvenile Hauling

A total of 27 loads of juveniles were hauled from Westland on 25 days between June 8 and July 19, 1995. The 370 gallon liberation units was used for all loads.

Because of high spring flows and McKay water releases during the peak outmigration periods, only an estimated 1,560 pounds of fish were hauled from Westland. Based on species composition sampling conducted by Bonifer/Minthorn personnel, approximately 98% of the fish transported from Westland were juvenile salmonids. Species composition information is included in Table 6 and juvenile hauling information is located in Appendix B.

Table 6. Species composition of fish sampled at Westland Juvenile facility in 1995

Date	Total No. Fish Sampled	Number Per Pound	Hatchery Production			Natural and Unknown Production			Rainbow Trout	Non-game and Warmwater Species
			Coho	Chinook	Summer Steelhead	Coho	Chinook	Summer Steelhead		
6 -08	393	61.0	0	378	1	0	12	0	0	2
6 - 09	472	59.5	0	453	0	2	17	0	0	0
6 - 12	563	70.9	0	533	0	0	30	0	0	0
6 - 14	328	47.3	0	289	1	0	30	0	4	4
6 - 16	396	52.4	0	355	0	0	38	0	0	3
6 - 19	344	49.1	0	311	0	2	31	0	0	0
6 -21	347	44.8	0	288	0	1	49	0	0	9
6 -23	228	30.7	0	155	0	3	57	0	0	13
6 -26	470	53.0	0	204	1	7	252	0	1	5
6 - 28	123	45.8	0	44	0	1	73	0	0	5
6 -30	189	51.3	0	44	0	3	137	0	0	5
7 -05	151	48.3	0	50	0	3	90	0	0	8
7 - 10	99	10.4	0	21	0	1	54	0	0	23
7 - 14	82	37.5	0	17	0	0	48	0	0	17
Total	4185	- - -	0	3142	3	23	918	0	5	94

Task 2.3 - Threemile Dam Juvenile Facility Operation

The Threemile Dam west bank juvenile bypass was not operated during the fall. It opened March 25, 1995 in conjunction with West Extension Irrigation District (WEID) beginning operations. It operated in the 25 cfs mode until April 1. At that time, ODFW passage research personnel began operating the facility to monitor juvenile outmigration. Natural and Phase I exchange flows allowed the bypass to continue operating until June 16 when it was closed for the season for canal maintenance and discontinuation of the Phase I exchange.

No juvenile trapping was required at Threemile Dam until July when the Phase I exchange was discontinued and WEID resumed river deliveries. ODFW passage research personnel operated the trap through the summer to monitor juvenile presence and hauled all juvenile salmonids captured during their monitoring effort. No juvenile salmonids were transported by Trap and Haul personnel from the Threemile Dam west bank juvenile facility this year.

Task 2.4 - Juvenile Releases

All juveniles hauled from Westland were released at the Umatilla River boat ramp.

Objective 3 - Passage Facility Monitoring

Task 3.1 - Passage Facility Inspections

Water temperature and flow, measured at Threemile Dam, exhibited extreme seasonal fluctuation during the year. The lowest daily mean temperature recorded was 1.1 C (34.0 F) on December 5, 1995 ; the highest daily mean temperature was 28.0 C (82.4 F) on July 18, 1995. The Ryan TempMentor digital recording thermometer stationed at the facility malfunctioned and data from October 12, 1994 to January 24, 1995 was lost. Temperature information from this period was gathered from instantaneous readings recorded with a hand held thermometer during Trap and Haul operations. Flows at the Umatilla gauging station ranged from a low of less than 4 cfs in July to a high of almost 7,000 cfs in February.

Umatilla River flow at Dillon is affected by McKay Reservoir storage releases, irrigation withdrawals and natural flows. Estimated flows at Dillon ranged from a low of less than 2 cfs in July to a high of 7,530 cfs in February. Flows at Yoakum ranged from 47 to 6,730 cfs and flows at Pendleton ranged from 32 to 5,950 cfs. Flow and temperature information for the project year is located in Appendix C.

Monitoring of juvenile and adult passage facilities located at the five major irrigation diversions and six smaller diversions uncovered numerous operational problems. The major problems noted

this year included ladder gate mechanical breakdowns, insufficient ladder attraction or access and inadequate bypass outfall channels.

Cold Springs Canal turned on and off a number of times during the spring. Juvenile salmonids were present in the canal forebay each time it was dewatered. The fish were flushed directly back to the river through the bypass by lowering the canal.

DISCUSSION

Objective 1 - Adult Trapping and Hauling

Task 1.1 - Threemile Dam Adult Trapping

The Threemile Dam east bank ladder and adult facility performed satisfactorily during the 1994-95 season. To maintain a stable forebay elevation at Threemile Dam, adjustments have to be closely coordinated between the east and west bank facilities and Phase I during the late spring as flows decrease.

Following discussions with BPA last summer, Phase I exchanges with WEID began on August 19. Exchanges continued until October 20 when WEID discontinued irrigation deliveries for the year. It was re-started on May 25 in conjuction with low flows and continued until June 30, the end of the designated Basin Project operations period. It is anticipated that start-up of the Phase I exchange each year will occur in mid-August rather than mid-September as originally planned to assist fall chinook migration and attraction into the lower Umatilla River. Fall chinook returns in August of 1994 were the earliest ever recorded for the Umatilla River since restoration efforts were begun in the early 1980's.

There is still some concern that the required maintenance activities (screen cleaning) at Threemile Dam are not being performed on an adequate basis during high flow periods. Heavy debris loads require a high level of maintenance to keep the adult facility pump system running. There were continual problems this year with the pumps shutting down because of lack of water due to plugged intake screens.

There were a number of mechanical breakdowns at the Threemile Dam east bank adult facility this year. Most were due to normal wear associated with continual use of the facility and were quickly repaired by U.S. Bureau of Reclamation (BOR) maintenance personnel. The biggest concern at the facility this year was the frequency of problems with the pump seals. BOR has requested that the pumps not be run during high silt periods to minimize wear on the seals. However, during a year like 1994-95 in which numerous high flow events occur, the facility is shut down for significant periods of time. A different type of pump or seal needs to be identified for use so facility down time can be minimized.

In early April, thunderstorms knocked out power to the site and damaged the facility electrical panel. This caused a loss of water flow to the adult holding pond and resulted in nine adult spring chinook mortalities. Because the power outage occurred at night, watch personnel were not aware of the problem until the next morning. There had been discussions in previous years of the need for alarms at the facility. BOR installed a holding pond pump flow alarm in May and will provide a power interruption alarm this fall.

There was an inordinate amount of physical damage (cuts, open wounds, and abrasions) observed on adult spring chinook trapped this year. Both recent and older wounds were observed. Damage was similar to that seen in 1992 prior to the steeppass entrance being modified. The ladder was drained and inspected and no obvious cause was noted. There were a large number of debris blockages this spring in the lower Umatilla River below Threemile Dam and it is thought that damage could have occurred either in the lower river or, possibly, because of the apparent age of some of the wounds, at one of the mainstem passage facilities. No unusual amount of damage was observed on any of the other species trapped at Threemile Dam.

The west bank adult ladder and trap were not operated this year. Previous evaluations recommended that all Trap and Haul operations take place exclusively at the east bank unless the east bank facility becomes inoperable.

Task 1.2 - Threemile Dam Adult Hauling

Project hauling equipment was generally adequate for adult transport needs in 1994-95. The small exit ports on the trailers still require us to use the 3,000 gallon tanker to haul adult chinook salmon.

Marginal temperature differentials (-10 F) were experienced again this year during the spring chinook hauling season. Only four spring chinook mortalities were observed and two of these were from mechanical damage. Overall, fish appeared in good condition at release. This is likely attributable to the low numbers and light hauling densities experienced. No delayed mortalities were observed at the release sites this year.

Summer steelhead broodstock were hauled to Bonifer instead of Minthorn until February. The Bonifer adult ladder was used as an interim holding pond while construction was being completed on the holding pond at Minthorn. Trap and Haul personnel assisted in transferring broodstock from Bonifer to Minthorn after completion of construction.

Task 1.3 - Threemile Dam Adult Anesthesia

The CO2 anesthesia system at Threemile Dam continues to perform well since the new anesthetic basket setup was installed last year.

Task 1.4 - Adult Releases

The adult release sites located downriver of Pendleton are inadequate. Barnhart was the only useable site for most of the year and is the only site accessible with the tanker. Access at Barnhart is poor during snow and high water and release conditions are marginal at lower flow levels. The Nolin release site had to be

relocated as it became inaccessible even for the trailers. Release conditions at the new site are marginal because high flow events have reconfigured the channel in this area. One or two developed release sites located downriver from Pendleton are still needed.

The two release sites located above Pendleton (Thornhollow and Imeques C-mem-ini-kern) used this year are both developed and access was not a problem. However, release conditions are marginal at both sites during low water because of shallow depths.

Adult release criteria was outlined in the 1994 Umatilla AOP. It called for all adults to be released at Threemile Dam whenever flows of over 150 cfs were anticipated for the subsequent 30 days. Although water was released from McKay Reservoir for adult attraction and passage from October 4 to October 29, it was not anticipated that the 30 day criteria would be met. Therefore, all adults designated for transport were hauled throughout most of the fall return season.

High flows beginning in mid-November allowed for release of adults at Threemile Dam from November 17 to January 27. Although flows remained well above criteria levels into April, adults were transported from Threemile Dam beginning January 28 due to passage concerns at Feed Canal diversion dam. All adults released at Threemile Dam were marked (caudal punch) so that fallbacks could be identified. Most of the twelve fallbacks recovered at Threemile Dam were captured shortly after high flow events.

Task 1.5 - Westland Relt Trapping and Hauling

Only three kelts were trapped and hauled from Westland this year. High flows throughout the spring allowed the majority of the kelts to volitionally migrate out of the system. None of the spring chinook fallbacks observed at Westland were caudal punched which indicates they were released above Pendleton.

Objective 2 - Juvenile Trannina and Hauling

Task 2.1 - Westland Juvenile Facility Operations

There were few problems at the Westland juvenile collection facility this year. Canal forebay elevations were more stable than in previous years. This was probably related to the higher flows experienced this spring which allowed the automated headgate system to be operated in control sequence #l. In sequence #l, adjustments are made at the river headgates rather than the downstream check gates. Past problems with fluctuating canal levels were experienced primarily when the system was operated in control sequence #2 where adjustments are made at the downstream check gates. Stable forebay levels also allowed proper pump adjustments to be made resulting in less facility operations water being lost downriver.

The bypass outfall operated satisfactorily this spring. However, this year's high flow events cut behind the outfall structure and the outfall is now located mid-channel. Continued high flow events next year may result in the outfall structure being repositioned outside of the channel and the same concerns identified in 1993 could reoccur.

No problems associated with adults or juveniles accessing the pumpback bay through the flap box sump were experienced this year. Keyway guides were installed in the flap box sump and check boards and a screen were inserted to preclude fish from entering into the flap box sump and pumpback bay.

High flows until the end of May allowed the facility to be operated in the bypass mode during the majority of the juvenile outmigration period. Water from McKay Reservoir was released for juvenile passage on May 31 in conjunction with the fall chinook subyearling releases. Subyearling fall chinook outmigrationthrough the system was monitored and peak migration appeared to reach Threemile Dam on June 3. Flows from McKay Reservoir were increased on June 6 to flush the remaining fish out of the system and were discontinued on June 7. The bypass was closed on June 7 and trapping began on June 8.

Juvenile salmonid trapping numbers steadily decreased at Westland from late June until mid-July. Trap and haul operations continued until July 19 when trap numbers of juvenile salmonids reached zero and the facility was shut down for the season. As Phase II begins implementation, we expect that McKay Reservoir water will be used to provide passage for the majority of the juvenile outmigration and that trap and haul operations will only be implemented to assist remnant portions of the outmigration.

High water temperatures at Westland continue to be a concern and reduce the ability to trap and hold fish. Standard operating procedures when larger numbers of salmonids are being captured (over 200 lbs/day) is to allow juveniles to enter the trap only during night and early morning hours when temperatures are low and prevent them from entering the trap the remainder of the day.

Poor water quality conditions and limited trap capacity still restrict the number of smolts that can be effectively transported from Westland. Significant losses of juveniles occurred this year in mid to late June due to gill disease, probably associated with the poor water quality conditions. The number of smolts encountered during peak juvenile outmigrations exceeds the capabilities of the facility and efforts to supply water for volitional fish migration during peak periods need to continue.

Task 2.2 - Westland Juvenile Hauling

A Neilson fish pump was borrowed from Lookinglass Hatchery again this year to load fish hauled out of Westland. However, due to the small numbers of salmonids trapped the fish pump was not used and all fish were loaded by dipnet We plan to continue using the Neilsen pump in the future. The Pescalator fish pump is still stationed at Westland and would be available for use by another project in the Columbia Basin if so desired.

Task 2.3 - Threemile Dam Juvenile Facility Operations

The Phase I exchange with WEID provides water for passage from Threemile Dam to the mouth of the Umatilla River. It is anticipated that Phase I will continue to provide adequate water at the proper time for juvenile outmigration below Threemile Dam and that the west bank juvenile facility will be operated in the bypass mode.

Task 2.4 - Juvenile Releases

High temperatures continue to be noted at the Umatilla River boat ramp juvenile release site. Temperatures of over 70 F were recorded again this year.

Objective 3 - Passage Facility Monitoring

Task 3.1 - Passage Facility Inspections

With one major exception, the accuracy and timeliness of flow data from the Hydromet gauging stations have been adequate for project operational decisions. The Dillon gauge site is located in a stream reach that experiences radical changes in channel morphology and it has been difficult for OWRD to maintain accurate rating curves at the station. This gauge site is the most important for project needs as it is located below the major diversions and at the low flow point of the river. Accurate readings at this gauge site are essential for adult and juvenile passage decisions related to trap and haul operations. Decisions of whether to trap or bypass smolts, how to operate fish passage facilities, and at what flows adults and juveniles can effectively migrate are made based on information from this gauging station.

Trap and Haul operational criteria for both adult and juvenile salmonids is still based on the 1981U.S. Fish and Wildlife Service report that identified 150 cfs for either 10 or 30 days as the critical flow level and duration for passage through the lower 30 miles of the Umatilla River. Recent observations of juvenile and adult migration behavior suggest that these criteria are too general to apply across all species and life history stages and should continue to be re-evaluated.

Weekly inspections of lower Umatilla River adult passage facilities revealed continual mechanical problems associated with the hydraulic ladder gate system at Westland. This has been an ongoing concern over the last three years. The hydraulic system is a maintenance dilemma and needs to be replaced. Mechanical problems precluded operation of the ladder within established passage criteria for essentially the entire 1994-95 return year. The high flow gate at Stanfield ladder was also inoperable for a short time in December but was quickly repaired by BOR.

There were adult passage concerns associated with ladder access this year at Feed Canal diversion dam. A number of high flow events resulted in massive gravel deposition both above and below the diversion dam. Gravel deposition above the dam resulted in large flow reductions to the ladder and deposits below the dam isolated the ladder from the main river channel. There were at least three attempts made to correct these problems by moving the gravel deposits. These were only temporary corrections as high water continued to re-deposit gravel into the same locations. Large numbers of steelhead were detected trying to jump the dam in late January. On January 28, over 80 unsuccessful attempts at leaping the dam were observed in a one hour period. This concern resulted in the decision to haul all steelhead above the diversions even though passage flows were adequate for release at Threemile Dam.

There was a substantial buildup of gravel at the Stanfield ladder fishway exit also. However, radio tracking data indicated that this buildup had little effect on adult passage at the ladder as most adults were not using the ladder to traverse the diversion dam (J. Volkman, personal communication, 1995). Further analysis and discussion of adult passage at all ladder sites will be included in the Adult Passage section of the UBNPME annual report.

The Brownell diversion dam and fishway are still a concern. Although at higher flows adults can migrate upstream around the dam and fishway, high debris loads deposit material on the dam and fishway which become a passage barrier when flows drop in late spring. We again recommend that the dam and fishway be either modified or removed.

Monitoring of juvenile screen sites and bypasses identified concerns with the bypass outfalls at three sites this year. All were related to the high flows experienced. Changes in channel morphology left the Dillon bypass outfall out of water, the Forth diversion screen outfall channel filled in with material and fish had to traverse approximately 50 yards of extremely shallow channel to access the river, and the river cut away approximately 40 feet of bank behind the Westland outfall repositioning it mid-channel and exposing the bypass pipe to the main river current. All three of these sites need corrective action.

Timing was favorable this year at the West Wilson diversion and it was not in operation during the juvenile outmigration periods. However, there is still a concern with the screen situation at this diversion. The screen is undersized and is removed in order to divert the needed amount of water. The screen problem and loss of juveniles at the site has been identified in our last three annual reports and communicated to the appropriate sources for action but no attempts have been made to address it. We have proposed a solution to the land owner and will attempt to get the situation resolved before next spring.

During March releases of yearling spring chinook, a passage concern was observed at the Threemile Dam east bank ladder. The extremely large size (2-3/lb) of some of the yearling smolts precluded them from passing through the ladder lead gate and they would stack up between the lead gate and exit gates. The smaller smolts appeared to have no problem passing through the lead gate. The ladder was closed and the lead gate lifted to pass the larger smolts through the facility. The ladder remained closed for the next few days in an attempt to let the majority of the spring chinook yearlings migrate past the facility without entering the ladder. No previous observations of this kind have been noted with other large smolts such as steelhead. However, few fish this large have ever been released in the Umatilla River in the past.

Again due to the high water year experienced, McKay Reservoir filled at one of the earliest dates on record. BOR was forced to release large volumes of water outside the normal release periods to maintain the reservoir within the allotted fill curve. Intermittent flows down McKay Creek from February through May provided access for adults into the lower portion of the creek where they can become trapped when flows are discontinued. The barrier weir at the mouth of the creek to prevent this occurrence has not been completed and reports of steelhead and chinook adults in the lower creek were received. Spring chinook carcasses were observed by both Trap and Haul and CTUIR Natural Production personnel and one radio tagged summer steelhead was also confirmed in the creek.

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Appendix A. 1994-95 Threemile Dam Adult Transportation Summary

Date	Loading Site Temperature	Release Site Temperature	Number Hauled	Release Site	Liberation Unit
8-29	68	66	2	Barnhart	Trailer
9-14	66	66	1	Barnhart	Trailer
9-19	68	67	3	Barn hart	Trailer
9-26	67	68	6	Barnhart	Trailer
10-05	59	52	2	Nolin	Trailer
1 O-07	58	56	2	Barnhart	Trailer
10-09	58	57	29	Barnhart	Tanker
IO-10	61	55	13	Barnhart	Tanker
10-11	57	55	49	Barn hart	Tanker
10-12	54	54	211	Barnhart	Tanker
IO-13	58	55	15	Barnhart	Tanker
10-13	58	52	1	Minthorn	Trailer
IO-14	55	55	8	Barnhart	Tanker
IO-16	53	52	18	Barnhart	Tanker
10-17	53	51	11	Barnhart	Tanker
10–18	58	53	7	Barnhart	Tanker
10–19	57	55	11	Barn hart	Trailer
1 O-20	55	51	6	Barnhart	Tanker
1 o-21	56	55	15	Barnhart	Tanker
1 o-22	56	NA	73	Barn hart	Tanker
1 O-23	57	50	36	Barnhart	Tanker
1 O-24	55	NA	13	Barnhart	Tanker
1 O-25	54	49	4	Barnhart	Trailer
1 O-26	55	51	2	Barnhart	Trailer
1 O-27	52	55	9	Barnhart	Trailer
1 O-28	53	52	25	Barn hart	Tanker
1 o-29	48	47	221	Barnhart	Tanker
1 O-30	51	47	194	Barn hart	Tanker
1 o-31	51	52	84	Barnhart	Tanker
10-31	51	NA	7	Minthorn	Trailer
11-01	52	48	18	Barnhart	Tanker
11-02	50	43	17	Barnhart	Tanker
11-03	50	43	10	Barnhart	Tanker
11-04	49	43	8	Barnhart	Tanker
11-06	49	43	5	Barnhart	Tanker
11-07	49	51	6	Barnhart	Trailer
11-09	45	NA	4	Barnhart	Tanker
11-10	47	NA	5	Barnhart	Tanker
11-11	46	47	23	Barnhart	Trailer
11-14	47	43	82	Barnhart	Tanker
11-15	47	43	5	Barnhart	Tanker
I1-16	48	44	12	Barnhart	Tanker
11-16	48	53	4	Bonifer	Trailer
11-17	46	NA	3	Bonifer	Trailer
11-21	44	46	1	Bonifer	Trailer
11-28	46	44	2	Bonifer	Trailer
11-29	43	41	1	Bonifer	Trailer

Appendix A. (continued)

Date	Loading Site Temperature	Release Site Temperature	Number Hauled	Release Site	Liberation Unit
12-02	49	45	1	Bonifer	Trailer
12-14	37	35	3	Bonifer	Trailer
12-19	43	39	8	Bonifer	Trailer
12-22	42	44	9	Bonifer	Trailer
12-23	42	44	12	Bonifer	Trailer
12-27	43	44	4	Bonifer	Trailer
1-20	40	43	11	Bonifer	Trailer
1-23	35	36	2	Bonifer	Trailer
1-25	39	37	1	Bonifer	Trailer
1-28	41	40	33	Nolin	Trailer
1-29	42	40	38	Barnhart	Trailer
1-30	44	46	20	Nolin	Trailer
1-30	44	45	16	Bonifer	Trailer
1-31	49	50	23	Barn hart	Trailer
1-31	49	44	14	Bonifer	Trailer
2-01	49	48	16	Barnhart	Trailer
2-07	43	42	23	Barnhart	Trailer
2-08	43	42	18	Barnhart	Trailer
2-09	46	45	28	Barnhart	Trailer
2-10	41	40	32	Nolin	Trailer
2-12	38	37	39	Barnhart	Trailer
2-13	32	33	4	Barnhart	Trailer
2-13	32	NA	7	Minthorn	Trailer
2-17	42	42	9	Nolin	Trailer
2-19	39	45	51	Barn hart	Trailer
2-23	46	NA	8	Barn hart	Trailer
2-23	46	45	2	Minthorn	Trailer
2-24	46	NA	10	Nolin	Trailer
2-24	46	NA	2	Minthorn	Trailer
2-25	48	46	38	Nolin	Trailer
2-26	49	46	58	Barnhart	Trailer
2-27	46	42	8	Nolin	Trailer
2-27	46	45	12	Bonifer	Trailer
2-28	46	42	7	Barnhart	Trailer

Appendix A. (continued)

Date	Loading Site Temperature	Release Site Temperature	Number Hauled	Release Site	Liberation Unit
3-01	39	42	3	Barnhart	Trailer
3-02	40	41	2	Barnhart	Trailer
3-06	45	41	18	Barnhart	Trailer
3-06	45	46	2	Minthorn	Trailer
3-07	42	39	6	Barnhart	Trailer
3-08	45	46	2	Barnhart	Trailer
3-08	45	46	1	Minthorn	Trailer
3-09	47	46	5	Barnhart	Trailer
3-10	50	50	17	Barnhart	Trailer
3-12	51	52	45	Barnhart	Trailer
3-13	51	48	13	Nolin	Trailer
3-13	51	54	9	Minthorn	Trailer
3-14	50	51	14	Barnhart	Trailer
3-15	49	51	16	Barnhart	Trailer
3-23	48	45	9	Barnhart	Trailer
3-24	47	43	19	Nolin	Trailer
3-24	47	46	7	Minthorn	-Trailer
3-26	48	50	24	Barnhart	Trailer
3-27	47	44	22	Nolin	Trailer
3-27	47	NA	3	Minthorn	Trailer
3-28	49	NA	14	Barnhart	Trailer
3-29	50	44	15	Barnhart	Tanker
3-30	50	51	10	Barnhart	Trailer
3-31	52	49	5	Nolin	Trailer
4-03	54	50	14	Barnhart	Tanker
4 - 0 3	54	57	1	Minthorn	Trailer
4-04	57	60	4	Barnhart	Trailer
4-05	56	58	1	Barnhart	Trailer
4-06	53	60	2	Nolin	Trailer
4-06	53	60	1	Minthorn	Trailer
4-07	54	47	8	Barnhart	Tanker
4-09	49	49	19	Barnhart	Tanker
4-10	50	45	9	Barnhart	Tanker
4-10	50	58	4	Minthorn	Trailer
4-11	50	46	6	Barnhart	Trailer
4-12	50	52	7	Barnhart	Trailer
4-13	49	50	5	Barnhart	Trailer
4-13	49	52	1	Minthorn	Trailer
4-14	48	44	9	Barnhart	Tanker
4-17	50	46	28	Barnhart	Tanker
4-18	49	47	7	Barnhart	Tanker
4-19	51	46	6	Barnhart	Tanker
4-20	52	47	a	Barnhart	Tanker
4-20	52	52	2	Minthorn	Trailer
4-21	54	49	10	Barnhart	Tanker
4-22	54	47	5	Barnhart	Tanker
4-23	58	50	2	Barnhart	Tanker
4-24	60	53	a	Barnhart	Tanker
4-25	60	54	5	Barnhart	Tanker
4-27	60	54	9	Barnhart	Tanker

Appendix A. (continued)

Date	Loading Site Temperature	Release Site Temperature	Number Hauled	Release Site	Liberation Unit
5-15	60	52	5	Barnhart	Tanker
5-16	55	50	50	Thornhollow	Tanker
5-17	55	49	78	Imeques	Tanker
5-18	53	51	78	Thornhollow	Tanker
5-19	55	49	31	Imeques	Tanker
5-20	55	50	32	Thornhollow	Tanker
5-21	65	55	21	Imeques	Tanker
5-22	54	51	8	Thornhollow	Tanker
5-23	56	50	5	Imeques	Tanker
5-24	59	58	13	Thornhollow	Tanker
5-25	61	54	8	Imeques	Tanker
5-26	61	57	1	Thornhollow	Tanker
5-28	64	54	3	Imeques	Tanker
5-30	67	62	4	Thornhollow	Tanker
6-01	72	65	1	Imeques	Trailer
6-02	70	64	2	Thornhollow	-- Trailer
6-05	63	58	2	Thornhollow	Trailer
6-06	58	48	2	Imeques	Tanker
6-07	57	51	5	Imeques	Tanker
6-08	62	55	1	Imeques	Trailer
6-09	66	60	2	Imeques	Trailer
6-11	62	58	3	Imeques	Tanker
6-13	62	NA	2	Imeques	Tanker
6-15	64	56	1	Imeques	Trailer
6-16	67	59	2	Imeques	Trailer
6-22	66	57	2	Imeques	Trailer
6-23	70	62	3	Thornhollow	Trailer
6-26	73	63	2	Thornhollow	Trailer

Appendix B. 1994–95 Westland Juvenile Transportation Summary

Date	Loading Site Temperature	Release Site Temperature	Pounds Hauled	Release Site	Liberation Unit
6–08	55	62	70	URBR	Trailer
6–09	61	66	139	URBR	Trailer
6–11	62	68	185	URBR	Trailer
6–12	64	65	140	URBR	Trailer
6–12	64	68	70	URBR	Trailer
6–13	62	64	90	URBR	Trailer
6–14	60	64	50	URBR	Trailer
6–15	60	65	85	URBR	Trailer
6–16	60	69	92	URBR	Trailer
6–19	61	60	46	URBR	Trailer
6–19	62	NA	150	URBR	Trailer
6–20	59	63	60	URBR	Trailer
6–21	57	65	92	URBR	Trailer
6–22	61	66	50	URBR	Trailer
6–23	66	70	30	URBR	Trailer
6–26	70	74	30	URBR	Trailer
6–27	68	70	20	URBR	Trailer
6–28	66	67	6	URBR	Trailer
6–30	69	70	15	URBR	Trailer
7–03	65	69	23	URBR	Trailer
7–05	65	71	23	URBR	Trailer
7–07	67	72	11	URBR	Trailer
7–10	66	68	46	URBR	Trailer
7–12	67	69	3	URBR	Trailer
7–14	67	72	3	URBR	Trailer
7–17	70	76	20	URBR	Trailer
7–19	70	75	11	URBR	Trailer

Appendix C. 1994-95 Umatilla River Water Parameter Data

Date	3MD Temps C	3MD Temps F	Flow @ Umatilla	Flow @ Pendleton	Flow @ Yoakum	SFC Flows	c s c Flows	WLC Flows	Flow @ Dillon
01-Sep-94	NA	NA	67	33	138	83	0	27	3
02-Sep-94	NA	NA	63	33	140	87	0	27	3
03-Sep-94	NA	NA	62	35	139	81	0	28	4
04-Sep-94	NA	NA	60	38	132	74	0	49	6
05-Sep-94	NA	NA	61	36	118	71	0	51	5
06-Sep-94	19.9	67.8	60	35	116	72	0	46	4
07-Sep-94	19.6	67.3	60	33	111	71	0	43	4
08-Sep-94	19.6	67.3	60	32	103	76	0	36	5
09-Sep-94	NA	NA	58	33	101	75	0	25	4
10-Sep-94	19.3	66.7	58	38	110	74	0	17	5
11-Sep-94	18.6	65.5	52	39	111	69	0	21	4
12-Sep-94	18.5	65.3	59	40	119	78	0	24	6
13-Sep-94	18.2	64.8	61	39	120	80	0	24	6
14-Sep-94	18.1	64.6	59	38	130	80	0	28	4
15-Sep-94	18.5	65.3	58	39	134	77	0	35	3
16-Sep-94	19.0	66.2	58	37	133	78	0	48	6
17-Sep-94	19.5	67.1	61	36	133	79	0	49	4
18-Sep-94	19.8	67.6	62	35	130	78	0	42	4
19-Sep-94	20.0	68.0	59	34	122	76	0	27	6
20-Sep-94	20.2	68.4	56	34	114	70	0	21	
21-Sep-94	19.8	67.6	56	35	115	68	0	16	
22-Sep-94	19.5	67.1	59	35	115	65	0	15	
23-Sep-94	18.9	66.0	56	35	122	66	0	15	
24-Sep-94	18.5	65.3	63	34	114	65	0	16	
25-Sep-94	18.4	65.1	64	34	104	62	0	16	
26-Sep-94	18.4	65.1	69	34	99	61	0	17	
27-Sep-94	18.6	65.5	71	34	100	61	0	16	
28-Sep-94	18.5	65.3	66	34	100	62	0	16	
29-Sep-94	17.9	64.2	65	39	106	64	0	16	5
30-Sep-94	16.7	62.1	66	51	118	63	0	19	6
01-Oct-94	15.6	60.1	67	48	82	25	0	21	11
02-Oct-94	15.1	59.2	74	44	53	0	0	21	11
03-Oct-94	15.5	59.9	79	44	47	0	0	21	i
04-Oct-94	15.4	59.7	76	44	58	0	0	19	5
05-Oct-94	15.3	59.5	78	44	137	0	0	17	6
06-Oct-94	15.3	59.5	162	44	148	0	0	19	81
07-Oct-94	15.0	59.0	187	44	148	0	0	19	9:
08-Oct-94	13.6	56.5	189	44	147	0	0	18	9:
09-Oct-94	13.2	55.8	190	43	145	0	0	17	9
10-Oct-94	13.6	56.5	190	43	144	0	0	19	101
11-act-94	13.2	55.8	183	44	144	0	0	20	10
12-Oct-94		55.0	188	45	145	0	0	20	10
13-Oct-94		58.0	194	47	149	0	0	20	11
14-Oct-94		58.0	207	56	165	0	0	18	12
15-Oct-94		NA	221	57	162	0	0	14	12'
16-Oct-94		53.0	223	55	151	0	0	14	11'
17-Oct-94		53.0	213	54	160	0	0	14	12
18-Oct-94		59.0	223	53	159	0	0	13	12
19-Oct-94		57.0	216	52	160	0	0	13	127
20-Oct-94		57.0	210	53	113	0	0	13	107
21-Oct-94		56.0	174	54	112	0	0	13	93
22-Oct-94		56.0	173	58	114	0	0	13	94
23-Oct-94		57.0	179	56	115	0	0	13	98
24-Oct-94		55.0	181	54	113	0	0	13	97
25-Oct-94		54.0	178	54	113	0	0	13	97
26-Oct-94		55.0	176	54	113	0	0	12	97
27-Oct-94		52.0	190	61	144	0	0	12	IO!
28-Oct-94		55.0	245	78	212	0	0	12	19
29-Oct-94		48.0	269	72	135	0	0	12	12
30-Oct-94		51.0	202	65	84	0	0	12	7'
31-Oct-94		53.0	154	73	83	0	0	10	7:

Appendix C. (continued)

Date	3MDTemps C	3MDTemps F	Flow @ Umatilla	Flow @ Pendleton	Flow @ Yoakum	SFC Flows	c s c Flows	WLC Flows	Flow @ Dillon
I-Nov-94		52.0	191	219	189	0	0	3	150
2-Nov-94		50.0	339	200	240	0	31	0	252
3-Nov-94		50.0	312	146	173	0	41	0	164
4-Nov-94		49.5	253	144	161	0	0	0	167
5-Nov-94		NA	269	200	209	0	0	0	200
6-Nov-94		49.0	322	182	197	0	0	0	208
7-Nov-94		49.0		199	206	0	0	0	207
8-Nov-94		NA	318	208	215	0	0	0	219
9-Nov-94		45.0	332	330	301	0	0	0	261
O-Nov-94		47.0	500	484	494	0	62	0	372
I-Nov-94		46.0	524	434	486	0	139	0	311
2-Nov-94		NA	383	407	426	0	139	0	235
3-Nov-94		NA	463	424	463	0	108	0	301
4-Nov-94		47.0	392	361	412	0	113	0	248
5-Nov-94		48.0	470	315	357	0	20	0	299
6-Nov-94		48.0	458	304	332	0	0	0	297
7-Nov-94		46.0	450	304	329	0	0	0	310
8-Nov-94		NA	435	276	294	0	0	0	280
IS-Nov-94		NA	391	258	270	0	0	0	257
20-Nov-94		NA	371	343	310	0	0	0	263
21-Nov-94		44.0	467	430	444	0	82	0	326
22-Nov-94		42.0	373	368	401	0	132	0	239
23-Nov-94		36.0	351	321	350	0	66	0	260
24-Nov-94		NA	436	287	311	0	0	0	304
25-Nov-94		NA	411	280	296	0	0	0	280
26-Nov-94		NA	418	295	314	0	0	0	293
27-Nov-94		NA	418	283	300	0	0	0	283
28-Nov-94		39.0	395	271	287	0	0	0	271
29-Nov-94		NA	381	269	271	0	0	0	258
30-Nov-94		45.0	391	602	495	0	51	0	321
01-Dec-94		NA	976	1380	1440	0	177	0	1090
02-Dec-94		49.0	1461	1230	1340	0	195	48	1080
03-Dec-94		NA	1046	933	1020	0	194	69	751
04-Dec-94		NA	766	689	789	0	197	59	505
05-Dec-94		34.0	551	552	620	0	197	56	324
06-Dec-94		36.0	448	492	546	0	115	38	334
07-Dec-94		NA	577	431	486	0	77	4	352
08-Dec-94		35.0	494	380	423	0	69	2	305
OS-Dee-94		NA	436	347	385	0	72	2	269
10-Dec-94		NA	361	320	356	0	76	0	236
11-Dee-94		NA	387	304	336	0	42	0	254
12-Dec-94		43.0	369	292	320	0	26	0	249
13-Dec-94		40.0	403	279	305	0	0	0	259
14-Dec-94		37.0	383	268	291	0	0	0	24i
15-Dec-94		38.0	369	264	283	0	0	0	*23i*
16-Dec-94		42.0	343	303	295	0	0	0	24-
17-Dec-94		NA	427	960	731	0	42	0	44t
18-Dec-94		47.0	1702	1980	2130	0	148	3	173(
19-Dec-94		43.0	2156	1530	1900	0	195	56	174(
20-Dec-94		45.0	1454	1240	1310	0	201	56	120(
21-Dec-94		44.5	1066	969	1010	0	203	53	87:
22-Dec-94		42.0	807	809	841	0	201	53	65!
23-Dec-94		39.0	574	672	NA	0	200	53	51:
24-Dec-94		42.0	526	610	NA	0	199	53	42!
25-Dec-94		NA	NA	576	NA	0	198	53	371
26-Dec-94		NA	391	586	NA	0	198	53	34:
27-Dec-94		43.0	603	1380	1370	0	208	54	87!
28-Dec-94		45.0	2109	1560	2110	0	207	54	192(
29-Dec-94		NA	1792	1460	1590	0	200	54	150(
30-Dec-94		35.0	1214	1130	1160	0	200	54	104(
31-Dec-94		NA	819	852	895	0	201	54	69!

Appendix C. (continued)

Date	3MDTemps C	3MDTemps F	Flow @ Umatilla	Flow @ Pendleton	Flow @ Yoakum	SFC Flows	c s c Flows	WLC Flows	Flow @ Dillon
Ol-Jan-95		NA	656	661	709	0	197	54	479
02-Jan-95		NA	647	552	587	0	150	32	426
03-Jan-95		NA	647	473	498	0	23	5	441
04-Jan-95		NA	647	434	454	0	0	5	384
05-Jan-95		NA	647	422	477	0	0	5	345
06-Jan-95		NA	647	378	406	0	0	5	319
07-Jan-95		NA	647	327	334	0	0	5	286
08-Jan-95		NA	629	340	320	0	0	4	262
09-Jan-95		NA	620	743	682	0	0	5	634
IIO-Jan-95		35.0	688	565	499	0	18	4	419
11-Jan-95		NA	a49	1050	931	0	30	4	865
12-Jan-95		NA	1163	1100	1040	0	34	4	1070
13-Jan-95		40.0	1123	1240	1110	0	41	13	1070
14-Jan-95		42.0	2314	3770	3070	0	41	16	2890
15-Jan-95		NA	4136	3650	3370	0	41	15	3740
16-Jan-95		NA	2898	1680	2280	0	109	20	2460
17-Jan-95		NA	1994	1490	1680	0	174	29	1760
18-Jan-95		41.0	1511	1380	1450	0	205	36	1430
19-Jan-95		42.0	1482	1420	1510	0	206	41	1440
20-Jan-95		40.0	1360	1290	1330	0	203	45	1260
21-Jan-95		NA	1079	1100	1140	0	200	47	1070
22-Jan-95		39.0	890	970	984	0	197	47	907
23-Jan-95		35.0	734	al9	a55	0	193	46	773
24-Jan-95		38.5	624	692	753	0	192	47	665
25-Jan-95	7.1	44.8	534	617	683	0	191	49	588
26-Jan-95	7.6	45.7	469	584	635	0	la9	51	545
27-Jan-95	8.4	47.1	425	565	607	0	199	50	50E
28-Jan-95	9.2	48.6	402	553	590	0	206	51	485
29-Jan-95	9.3	48.7	392	551	593	0	209	51	476
30-Jan-95	9.8	49.6	416	683	685	0	212	51	524
31-Jan-95	12.2	54.0	827	2300	1840	0	212	51	1300
01-Feb-95	11.2	52.2	4396	4650	4790	0	196	49	5050
02-Feb-95	9.9	49.8	5897	5950	6730	0	189	52	7600
03-Feb-95	9.6	49.3	6977	3880	4400	0	138	51	4620
04-Feb-95	9.7	49.5	3514	2470	2990	0	as	51	2650
05-Feb-95	10.0	50.0	2921	1310	2510	0	62	51	2020
06-Feb-95	9.8	49.6	2578	1130	2250	0	49	51	1840
07-Feb-95	9.6	49.3	2318	1150	2040	0	41	51	1760
08-Feb-95	9.6	49.3	2158	1060	1790	0	13	51	1590
OS-Feb-95	9.1	48.4	1624	963	1500	0	204	51	1260
10-Feb-95	8.8	47.8	1248	825	1290	0	208		1060
11-Feb-95	a.9	48.0	1005	719	1140	0	208		896
12-Feb-95	7.7	45.9	887	651	1050	0	209		813
13-Feb-95	5.2	41.4	852	569	949	0	188	3	762
14-Feb-95	4.5	40.1	771	463	829	0	115	3	698
15-Feb-95	5.4	41.7	1038	444	1290	0	129	2	1040
16-Feb-95	7.4	45.3	1591	408	1480	0	143	1	1290
17-Feb-95	a.5	47.3	1528	437	1270	0	169	0	1110
18-Feb-95	9.8	49.6	1335	917	1480	0	184	0	1160
19-Feb-95	11.1	52.0	2027	1560	2070	0	192	1	1620
20-Feb-95	11.5	52.7	3271	3280	3400	0	198	2	3120
21-Feb-95	11.6	52.9	3715	2800	3420	0	199	1	3280
22-Feb-95	10.4	50.7	3485	1420	2840	0	201	0	2840
23-Feb-95	10.1	50.2	2718	803	2180	0	191	0	2210
24-Feb-95	10.6	51.1	2203	747	1880	0	194	0	1880
25-Feb-95	11.3	52.3	1990	747	la20	0	198	0	1800
26-Feb-95	11.0	51.8	1879	707	1680	0	192	0	1700
27-Feb-95	10.2	50.4	1666	639	1490	0	189	0	1550
28-Feb-95	8.4	47.1	1462	546	1290	0	184	0	1410

Appendix C. (continued)

Date	3 MD Temps C	F	Flow @ Umatilla	Flow @ Pendleton	Flow @ Yoakum	SFC Flows	c s c Flows	WLC Flows	Flow @ Dillon
01-Mar-95	7.6	45.7	1181	734	1130	0	180	0	1290
02-Mar-95	7.4	45.3	963	643	994	0	189	0	1190
03-Mar-95	8.1	46.6	a la	576	894	0	196	0	1100
04-Mar-95	9.1	48.4	741	553	838	0	194	0	1040
05-Mar-95	9.8	49.6	680	532	783	0	194	0	989
06-Mar-95	9.5	49.1	584	491	706	0	195	0	909
07-Mar-95	9.1	48.4	524	471	644	0	188	0	836
08-Mar-95	9.7	49.5	464	476	624	0	185	0	793
0g-Mar-95	10.4	50.7	546	515	760	0	208	0	923
1O-Mar-95	11.6	52.9	557	619	731	0	199	0	900
1l-Mar-95	12.0	53.6	658	825	851	0	205	0	1000
12-Mar-95	12.6	54.7	a35	1020	1010	0	215	0	1130
13-Mar-95	12.5	54.5	927	1120	1190	0	211	0	122c
14-Mar-95	12.3	54.1	1118	1340	1330	0	208	18	126C
15-Mar-95	11.9	53.4	3282	3450	4470	0	197	41	4030
16-Mar-95	10.5	50.9	4865	2910	4380	0	199	35	436C
17-Mar-95	10.6	51.1	4453	1610	3700	0	198	33	349c
18-Mar-95	11.4	52.5	3703	834	3080	0	197	30	287C
1g-Mar-95	11.3	52.3	3286	943	3020	0	198	29	271C
2!O-Mar-95	11.5	52.7	3170	974	2760	0	197	32	246C
2!l-Mar-95	10.9	51.6	2966	1030	2980	0	194	43	264C
2!2-Mar-95	10.0	50.0	2981	958	2540	0	182	42	23ac
23-Mar-95	10.4	50.7	2495	997	2000	0	185	57	190C
24-Mar-95	10.4	50.7	1852	952	1640	0	170	65	155c
25-Mar-95	10.1	50.2	1660	867	1510	0	164	60	147C
26-Mar-95	10.7	51.3	1472	785	1350	0	156	55	139C
27-Mar-95	11.2	52.2	1133	718	1020	0	151	57	109C
28-Mar-95	11.8	53.2	821	677	913	0	151	66	982
29-Mar-95	12.1	53.8	718	647	a31	0	166	69	91'
3SO-Mar-95	12.6	54.7	617	615	773	0	172	70	85;
31-Mar-95	13.3	55.9	526	568	724	0	186	77	805
01-Apr-95	14.3	57.7	453	557	727	0	la7	67	793
02-Apr-95	14.1	57.4	499	532	803	0	190	62	863
03-Apr-95	14.4	57.9	466	514	662	12	200	68	726
04-Apr-95	15.1	59.2	364	528	734	25	203	a7	707
05-Apr-95	14.6	58.3	375	587	814	69	205	112	714
06-Apr-95	4.5	58.1	569	763	1060	61	194	116	8813
07-Apr-95	4.7	58.5	621	949	1040	50	185	126	873
08-Apr-95	3.5	NA	756	1420	1530	49	184	126	12713
OS-Apr-95	12.4	54.3	1082	1360	1320	48	182	98	11413
10-Apr-95	12.5	54.5	975	1270	1330	48	181	99	1130
ll-Apr-95	13.3	55.9	1143	1240	1460	48	188	99	1240
12-Apr-95	13.1	55.6	991	1220	1410	49	187	103	1170
13-Apr-95	12.4	54.3	1221	1310	1590	51	183	99	1310
14-Apr-95	11.9	53.4	1080	1290	1390	51	167	96	1180
15-Apr-95	12.2	54.0	935	1200	1370	58	165	97	1140
16-Apr-95	12.5	54.5	988	1090	1390	70	166	96	1170
17-Apr-95	12.6	54.7	850	947	1190	70	117	107	1050
18-Apr-95	12.6	54.7	788	a40	1100	71	88	136	994
19-Apr-95	13.1	55.6	689	741	1020	71	123	137	911
20-Apr-95	13.7	56.7	548	714	979	71	129	137	849
21-Apr-95	13.8	56.8	543	674	904	75	91	147	824
22-Apr-95	15.2	59.4	419	616	895	a3	89	162	795
23-Apr-95	16.0	60.8	443	588	890	81	a9	171	797
24-Apr-95	17.0	62.6	440	588	869	91	89	176	777
25-Apr-95	17.8	64.0	328	644	832	97	60	176	757
26-Apr-95	17.3	63.1	470	645	a45	108	0	174	805
27-Apr-95	17.6	63.7	417	708	916	118	0	185	793
28-Apr-95	15.9	60.6	1063	1190	1620	100	62	176	1280
29-Apr-95	14.5	58.1	1136	1420	1870	91	140	162	1340
30-Apr-95	13.2	55.8	2900	2450	3730	91	154	140	2950

Appendix C. (continued)

Date	3 MD Temps C	F	Flow @ Umatilla	Flow @ Pendleton	Flow @ Yoakum	SFC Flows	c s c Flows	WLC Flows	Flow @ Dillon
Ol-May-95	14.0	57.2	3519	2060	3740	82	171	133	3230
0:Z-May-95	13.6	56.5	3724	3160	4360	91	194	140	NA
0:3-May-95	13.3	55.9	4425	3100	4410	91	177	149	NA
04-May-95	13.3	55.9	3772	1850	3860	99	177	150	NA
05–May–95	12.8	55.0	3367	1610	3610	a4	172	150	NA
06–May–95	13.2	55.8	4388	3500	5090	86	171	139	NA
07-May-95	13.5	56.3	5579	3530	4990	79	152	126	NA
08-May-95	14.4	57.9	4580	2260	4090	74	143	103	NA
0g-May-95	14.8	58.6	3745	la50	3710	67	106	92	NA
1O-May-95	14.9	58.8	4142	2110	3790	68	60	84	3260
1l-May-95	14.8	58.6	4405	3730	4720	69	81	73	4220
12-May-95	13.4	56.1	5472	4210	5210	59	99	79	5430
13–May–95	14.0	57.2	5140	3010	4240	54	123	84	3810
14-May-95	14.6	58.3	2492	1680	3110	53	115	a5	2490
15-May-95	15.9	60.6	2456	1480	2290	69	162	104	1620
16-May-95	16.9	62.4	1913	1340	1990	a5	157	134	1330
17-May-95	17.4	63.3	1464	1180	1600	96	154	164	1010
1a-May-95	16.4	61.5	1149	977	1400	99	149	170	839
1g-May-95	17.5	63.5	862	a32	1250	102	140	178	709
2!O-May-95	18.6	65.5	724	718	1110	104	129	187	610
2!l-May-95	19.3	66.7	523	641	932	112	111	192	489
4!2-May-95	18.9	66.0	387	574	816	115	44	194	437
23–May–95	19.2	66.6	410	513	792	114	0	210	44c
24-May-95	20.0	68.0	332	480	735	112	0	226	371
25–May–95	20.9	69.6	292	446	640	109	0	221	305
26–May–95	21.2	70.2	286	412	554	99	0	205	241
27–May–95	21.2	70.2	236	376	504	108	0	209	17E
28–May–95	22.0	71.6	173	343	459	117	0	215	12:
29–May–95	23.4	74.1	133	314	430	120	0	204	86
,SO-May-95	24.3	75.7	116	294	405	123	0	212	56
31–May–95	24.4	75.9	88	276	426	126	0	224	4:
Ol-Jun-95	24.2	75.6	85	261	476	125	0	226	102
02-Jun-95	23.3	73.9	127	253	531	122	0	219	12f
03–Jun–95	22.6	72.7	193	237	551	126	0	223	14:
04-Jun-95	22.5	72.5	165	218	533	126	0	232	11;
05–Jun–95	20.4	68.7	173	248	567	123	0	237	13:
06-Jun-95	17.2	63.0	239	245	595	109	0	204	16
07-Jun-95	16.8	62.2	353	268	567	88	0	179	19
oa-Jun-95	19.1	66.4	251	247	367	92	0	186	8
09–Jun–95	21.0	69.8	145	217	347	99	0	195	2
10–Jun–95	21.8	71.2	93	197	326	101	0	204	1
11-Jun-95	22.2	72.0	76	189	380	103	0	247	!
12-Jun-95	22.6	72.7	69	178	365	110	0	231	8
13–Jun–95	22.0	71.6	64	167	372	119	0	210	6
14-Jun-95	20.4	68.7	65	168	383	114	0	232	NA
15-Jun-95	20.3	68.5	98	183	348	107	0	204	NA
16-Jun-95	21.4	70.5	109	172	298	103	0	163	NA
17-Jun-95	21.1	70.0	80	163	254	104	0	119	NA
18–Jun–95	21.6	70.9	76	184	269	103	0	115	NA
19–Jun–95	21.1	70.0	76	329	440	98	0	155	NA
20-Jun-95	19.8	67.6	461	651	899	98	0	128	NA
21-Jun-95	19.5	67.1	773	585	873	94	0	137	NA
22-Jun-95	21.2	70.2	608	489	739	95	0	146	24
23-Jun-95	22.9	73.2	458	414	617	99	0	160	184
24-Jun-95	24.1	75.4	340	349	523	100	0	179	122
25-Jun-95	24.8	76.6	218	301	443	105	0	175	73
26-Jun-95	25.4	77.7	158	267	381	113	0	174	45
27-Jun-95	24.9	76.8	108	242	344	114	0	198	1(
28-Jun-95	24.5	76.1	74	214	348	113	0	195	1(
29-Jun-95	24.2	75.6	74	195	316	111	0	187	7
30–Jun–95	24.9	76.8	69	178	304	113	0	173	1

Appendix C. (continued)

Date	3 MD Temps C	3 MD Temps F	Flow @ Umatilla	Flow @ Pendleton	Flow @ Yoakum	SFC Flows	CSC Flows	WLC Flows	Flow @ Dillon
Ol-Jul-95	27.3	81.1	36	165	332	122	0	199	7
02-Jul-95	25.5	77.9	11	152	315	118	0	181	7
03-Jul-95	24.4	75.9	a	156	311	106	0	189	7
04-Jul-95	24.6	76.3	5	149	297	95	0	196	6
05-Jul-95	24.9	76.8	4	136	294	95	0	186	6
06-Jul-95	24.6	76.3	4	130	311	95	0	207	5
07-Jul-95	24.3	75.7	3	145	325	94	0	204	11
08-Jul-95	25.6	78.1	3	134	316	96	0	193	13
09-Jul-95	26.1	79.0	4	125	313	96	0	179	12
10-Jul-95	24.9	76.8	23	118	278	95	0	148	8
Il-Jul-95	25.1	77.2	17	110	311	108	0	171	7
12-Jul-95	25.7	78.3	7	102	316	114	0	167	7
13-Jul-95	24.2	75.6	4	101	314	108	0	168	7
14-Jul-95	24.1	75.4	3	96	307	110	0	166	6
15-Jul-95	25.5	77.9	4	91	300	112	0	161	6
16-Jul-95	26.5	79.7	3	87	331	119	0	178	6
17-Jul-95	27.5	81.5	3	a2	339	121	0	197	5
18-Jul-95	28.0	82.4	3	79	334	118	0	204	5
19-Jul-95	28.1	82.6	4	76	329	114	0	208	4
20-Jul-95	26.7	80.1	3	75	327	113	0	184	4
21-Jul-95	26.5	79.7	3	70	331	110	0	178	17
22-Jul-95	26.5	79.7	5	66	328	107	0	193	6
23-Jul-95	NA	NA	a	64	329	108	0	194	4
24-Jul-95	25.0	77.0	4	62	330	110	0	175	4
25-Jul-95	NA	NA	3	61	356	119	0	199	4
26-Jul-95	25.6	78.1	3	61	382	125	0	214	4
27-Jul-95	25.3	77.5	3	64	380	124	0	209	4
28-Jul-95	26.0	78.8	5	63	373	125	0	197	4
29-Jul-95	25.3	77.5	5	59	363	127	0	176	4
30-Jul-95	24.8	76.6	5	60	359	132	0	180	4
31-Jul-95	24.9	76.8	4	60	350	126	0	195	5
Ol-Aug-95	25.4	77.7	4	59	343	116	0	190	5
02-Aug-95	27.1	80.8	4	56	345	108	0	195	
03-Aug-95	27.6	81.7	3	56	342	103	0	196	9
04-Aug-95	27.8	82.0	3	55	338	104	0	196	10
05-Aug-95	27.3	al.1	3	54	325	99	0	196	9
06-Aug-95	26.1	79.0	4	51	322	97	0	194	i
07-Aug-95	23.8	74.8	4	61	325	96	0	188	5
08-Aug-95	22.6	72.7	5	68	323	95	0	187	
09-Aug-95	22.9	73.2	4	62	309	95	0	179	5
10-Aug-95	22.7	72.9	4	58	307	96	0	169	4
11-Aug-95	22.9	73.2	3	62	323	102	0	171	10
12-Aug-95	22.1	71.8	3	62	326	106	0	181	5
13-Aug-95	21.4	70.5	3	60	325	101	0	la3	6
14-Aug-95	22.0	71.6	9	58	320	95	0	187	5
15-Aug-95	22.0	71.6	82	57	307	91	0	192	5
16-Aug-95	21.7	71.1	74	60	289	88	0	181	5
17-Aug-95	21.0	69.8	64	58	288	91	0	175	
18-Aug-95	20.5	68.9	70	59	285	90	0	174	
19-Aug-95	18.9	66.0	73	55	279	91	0	160	
20-Aug-95	19.2	66.6	66	53	266	90	0	140	4
21-Aug-95	19.0	66.2	64	50	263	90	0	134	4
22-Aug-95	19.6	67.3	60	48	278	97	0	151	4
23-Aug-95	19.2	66.6	67	47	285	101	0	157	4
24-Aug-95	18.4	65.1	62	48	293	104	0	159	6
25-Aug-95	17.9	64.2	70	48	293	107	0	156	6
26-Aug-95	18.0	64.4	73	46	260	100	0	153	5
27-Aug-95	18.4	65.1	71	46	249	94	0	159	5
28-Aug-95	la.7	65.7	67	45	256	92	0	165	5
29-Aug-95	18.8	65.8	66	45	256	88	0	161	4
30-Aug-95	18.9	66.0	69	47	258	86	0	156	4
31-Aug-95	19.0	66.2	67	45	260	86	0	161	4