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TRAPPING AND TRANSPORTATION OF ADULT AND JUVENILE SALMON IN THE LOWER UMATILLA RIVER IN NORTHEAST OREGON, 19964997

UMATILLA RIVER BASIN TRAP AND HAUL PROGRAM

ANNUAL PROGRESS REPORT
OCTOBER 1996 - SEPTEMBER 1997

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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 30, 1996 to August 26, 1997. A total of 2,477 summer steelhead (Oncorhvnchus mykiss); 646 adult, 80 jack, and 606 subjack fall chinook (O. tshawytscha); 618 adult and 24 jack coho (0. kisutch); and 2,194 adult and four jack spring chinook (0. tshawvtscha) were collected. All fish were trapped at the east bank facility.

Of the fish collected, 22 summer steelhead; 18 adult and two jack fall chinook: five adult coho; and 407 adult and three jack spring chinook were hauled upstream from Threemile Dam. There were 2,245 summer steelhead; 70 adult, 51 jack and 520 subjack fall chinook: 593 adult and 24 jack coho; and 1,130 adult spring chinook released at Threemile Dam. In addition, 110 summer steelhead; 551 adult and 25 jack fall chinook; and 600 adult spring chinook were collected for broodstock.

The Westland Canal juvenile facility (Westland), located near the town of Echo at rivermile (RM) 27, is the major collection point for outmigrating juvenile salmonids and steelhead kelts. The canal was open for a total of 210 days between December 16, 1996 and July 30, 1997. During that period, fish were bypassed back to the river 175 days and were trapped on 35 days. An estimated 1,675 pounds of juvenile fish were transported from Westland to the Umatilla River boat ramp (RM 0.5). Approximately 80% of the juveniles transported were salmonids. No steelhead kelts were hauled from Westland this year.

The Threemile Dam west bank juvenile bypass was operated from October 4 to November 1, 1996 and from March 26 to July 7, 1997. The juvenile trap was not operated this year.

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 s'ummer steelhead in the Umatilla River Basin (Figure 1). The 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 4,967,000 juvenile salmon and steelhead were released into the Umatilla River in 1997 and long range production goals call for releasing up to 8,950,000 (CTUIR and ODFW 1989). In addition to 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 1996-97 reached only 6,600 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 both juvenile outmigration and adult return periods, parts of the lower river between Threemile and Stanfield dams can be dewatered, stranding migrating salmonids. The U.S. Fish and Wildlife Service (USFWS)(1981) and U.S. Bureau of Reclamation (BOR)(1988) have identified flows ranging from 150 cubic feet per second (cfs) to 300 cfs as being necessary for fish passage through the lower 30 miles of river. Flow enhancement and fish passage improvement projects are being implemented to improve passage conditions. However, even with these projects in place there are still periods when inadequate passage conditions exist.

The Umatilla River Trap and Haul Program was implemented to assist fish passage. The program goal is to maximize survival of adult and juvenile salmonids through the lower 30 miles of the Umatilla River. The two primary areas of responsibility for the program to meet this goal are: 1) to provide safe transportation for juveniles and adults around this heavily diverted stretch of river and 2) to ensure that fish passage and flow improvement projects are operated in a coordinated manner to facilitate adult and juvenile fish migration.

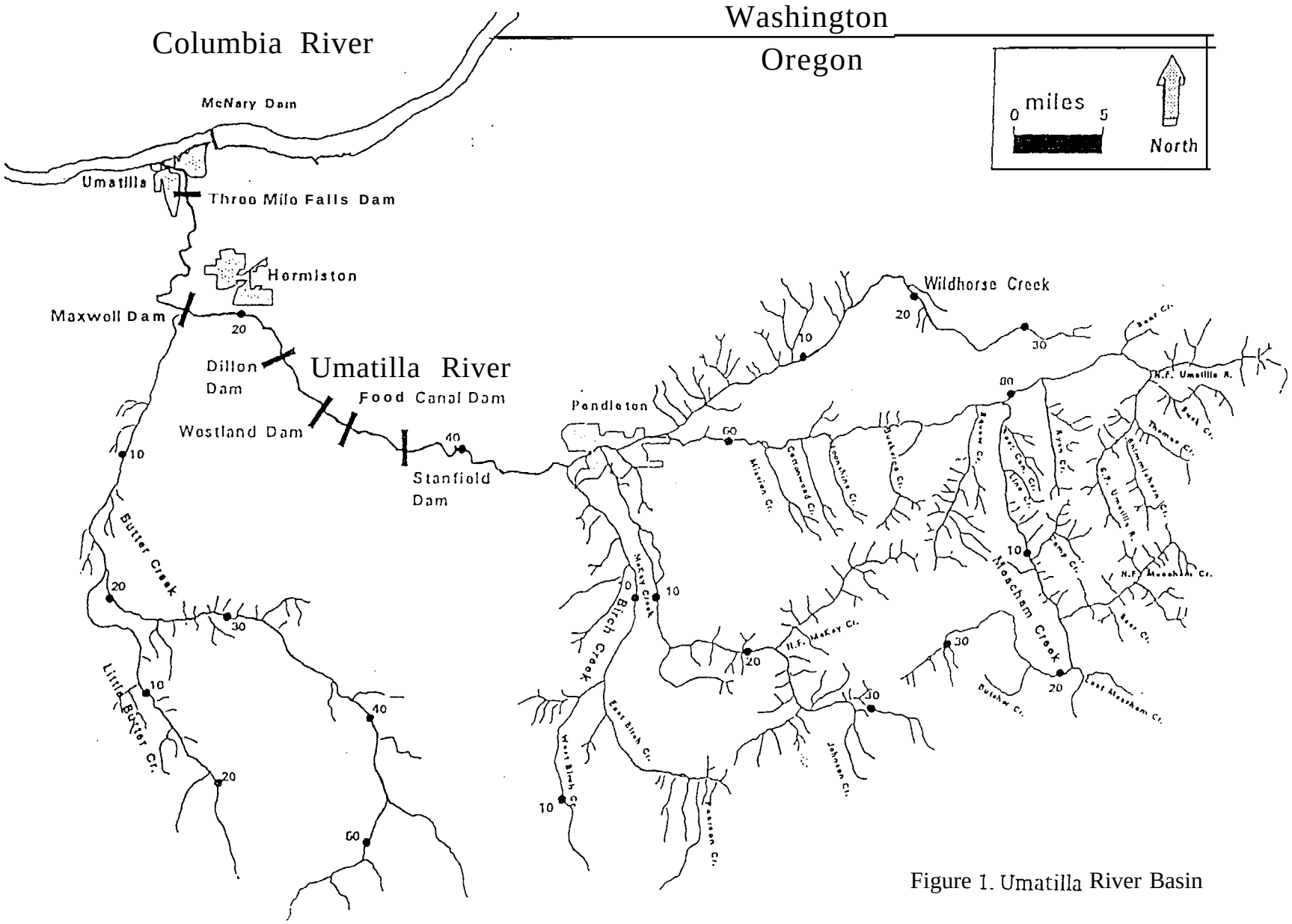

Figure 1. Umatilla River Basin

METHODS

Objective 1 – Passase Conditions Monitoring

Task 1.1 – Monitoring of River Conditions

Temperatures are monitored during the project year to help refine trap and haul operating guidelines. Temperatures are 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 is monitored at Pendleton (RM 54), Yoakum (RM 37), Dillon (RM 24.5) and Umatilla (RM 2). Daily irrigation usage is monitored for Stanfield, Westland, and Feed canals. River flow and irrigation usage data is provided by Oregon Department of Water Resources (OWRD) from the Hydromet flow gauging stations.

Task 1.2 – Inspection of Passage Facilities

Juvenile fish screen and adult ladder facilities, located at five major irrigation diversions and at several smaller diversions, are monitored throughout the year to ensure that adequate passage conditions exist for upstream and downstream migrants. Inspections include checking for proper installation and operation of screens, gaps and holes in screens or seals, debris buildup on screens and trash racks, proper flows to smolt bypasses and adult ladders, adequate access and exit conditions at bypasses and ladders, and signs of fish activity.

Task 1.3 – Coordination of Passage Projects

There are two components to the fish passage program in the lower Umatilla River: flow enhancement and physical passage facilities. It is essential that operation of these components be coordinated in conjunction with river conditions and diversion activities in order to maximize lower river migration conditions.

Phase I and II of the Umatilla Basin Project (UBP) along with other flow augmentation efforts are coordinated with BOR, OWRD, and the affected irrigation districts. The UBP target flows (BOR 1988) and USFWS (1981) minimum flow recommendations are used as general criteria for operation of the flow enhancement projects.

Bypass and ladder operations are coordinated with the Umatilla Passage Facility Operation and Maintenance (UPFO&M) crews using criteria developed by National Marine Fisheries Service (NMFS) as a general guideline for facility operations.

Objective 2 – Operation of Adult Trapping Facilities

Task 2.1 - 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, to the broodstock holding and spawning facility, directly into the dam forebay, or into transport tanks for hauling.

All fish routed through the sorting complex are anesthetized with carbon dioxide (C02) to reduce stress during the handling process. The capability does not exist to anesthetize adults trapped in the ladder.

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

Fall and spring chinook are classified as either adults (fork length greater than or equal to 24 inches) or jacks (fork length less than 24 inches) as outlined in ODFW sport fishing regulations. Subjack (or mini-jack) fall chinook are defined as less than 15 inches in fork length based upon historical length frequency data (CTUIR files). Coho adults are defined as fork length greater than or equal to 18 inches and jacks 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 are 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 are made to differentiate resident rainbow trout from summer steelhead (but generally less than 18 inches). No data are collected from fish designated as resident trout.

The east bank facility is manned 24 hours a day during the adult capture season. Permanent housing is provided for on-site personnel. In addition to providing security, watch personnel monitor facility operations, assist trap and haul operations, and make 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

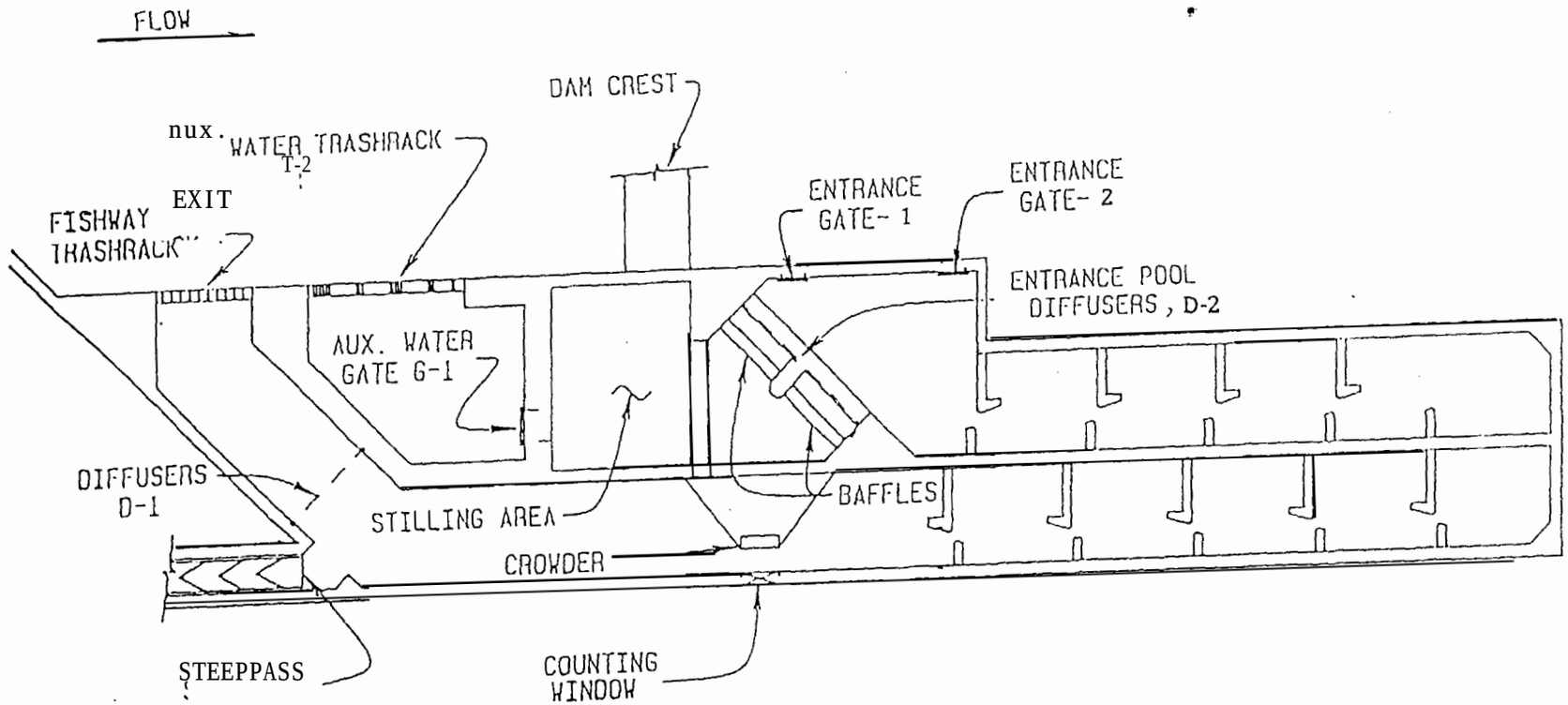

Figure 2. Threemile Dam East Bank Ladder

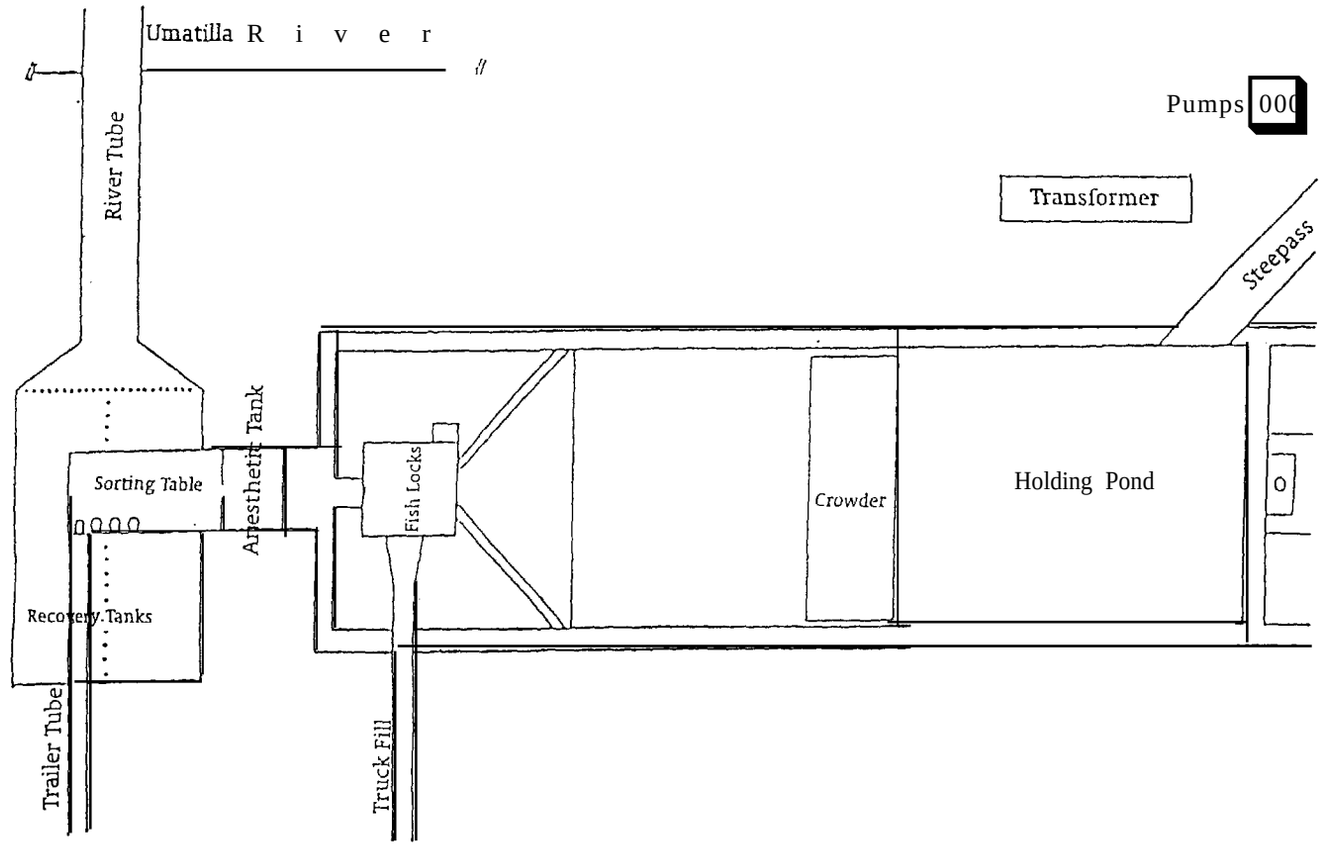

Figure 3. Threemile Dam East Bank Adult Facility

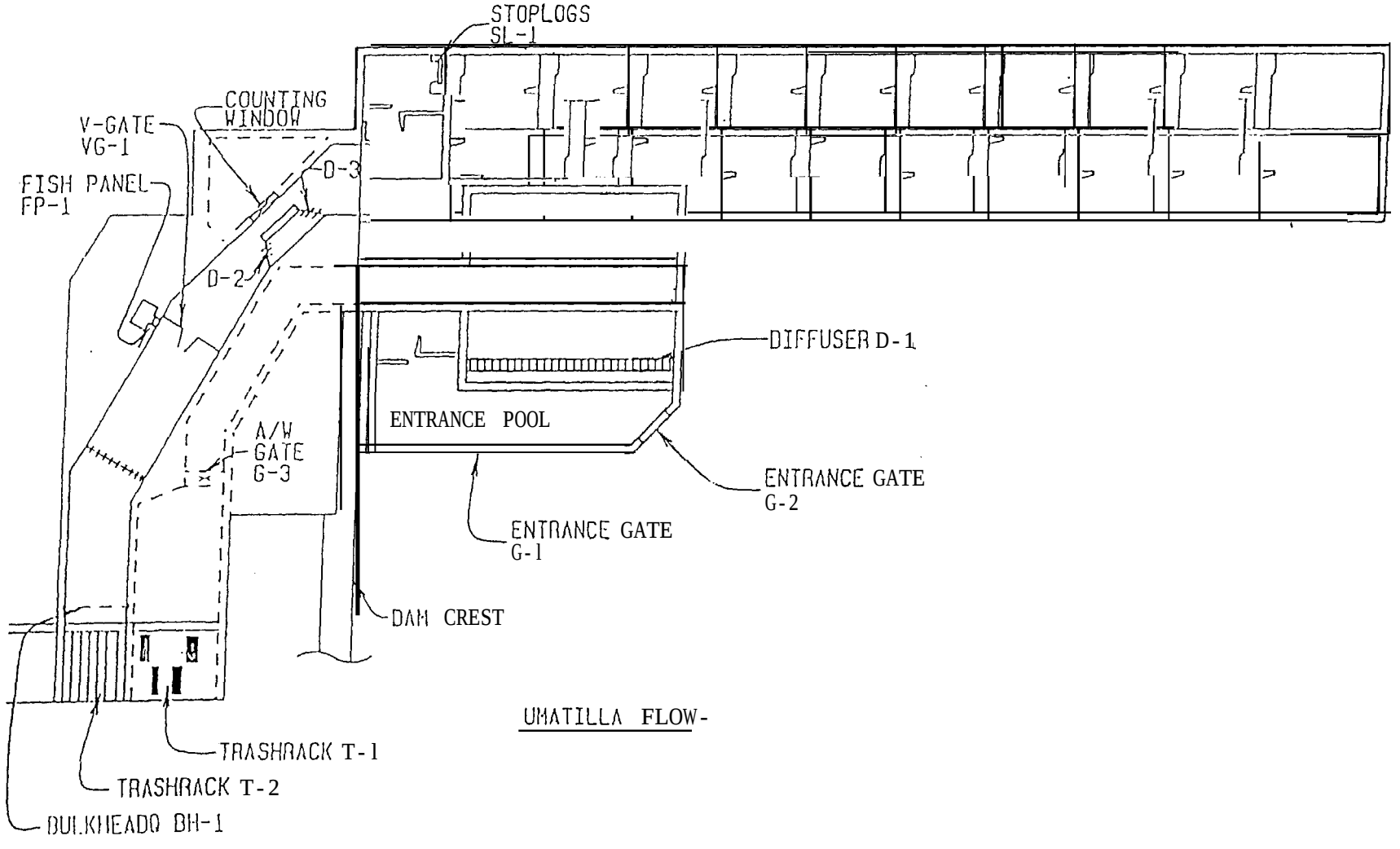

Figure 4. Threemile Dam West Bank Ladder and Adult Facility

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.

Task 2.2 - Westland Adult Trapping

Summer steelhead kelts may be captured at the Westland Canal juvenile facility during trapping operations. The facility has the ability to bypass kelts downriver during high flows or to trap them for transport during low flow periods. It is generally operated in the bypass mode during the majority of the kelt outmigration period. Other adults (such as spring chinook) may also be captured incidentally at the facility during trapping operations and are held for transport upstream. The only information collected from adults trapped at Westland is date, species, and number.

Objective 3 - Operation of Juvenile Trapping Facilities

Task 3.1 - Westland Juvenile Facility Operation

The Westland Canal juvenile 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.

Information collected at Westland includes dates of both canal operation and facility operational modes. Because the majority of the fish are now bypassed at Westland rather than trapped, the facility is no longer manned on a 24 hour basis.

Task 3.2 - 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.

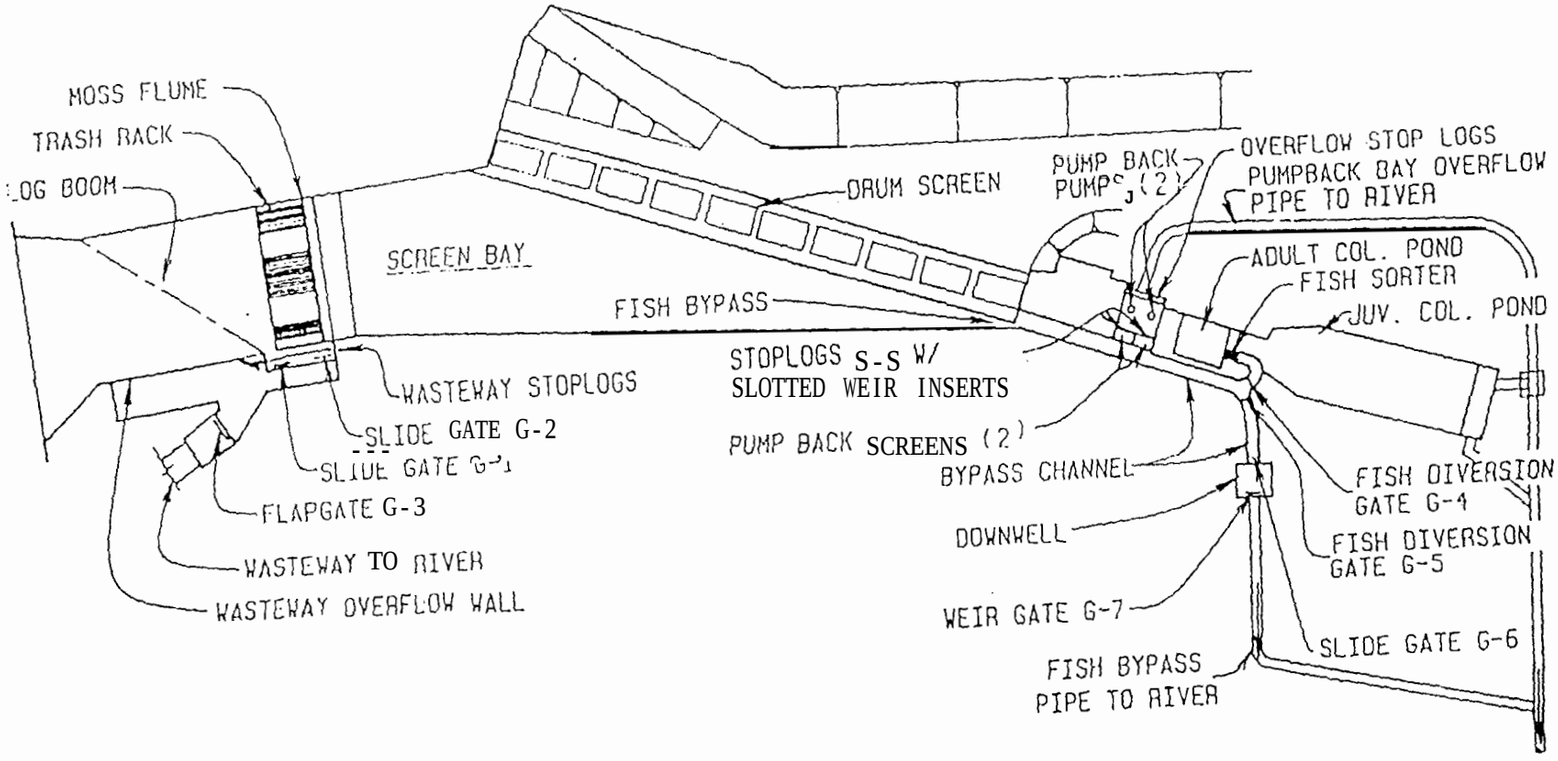

Figure 5. Westland Canal Juvenile Facility

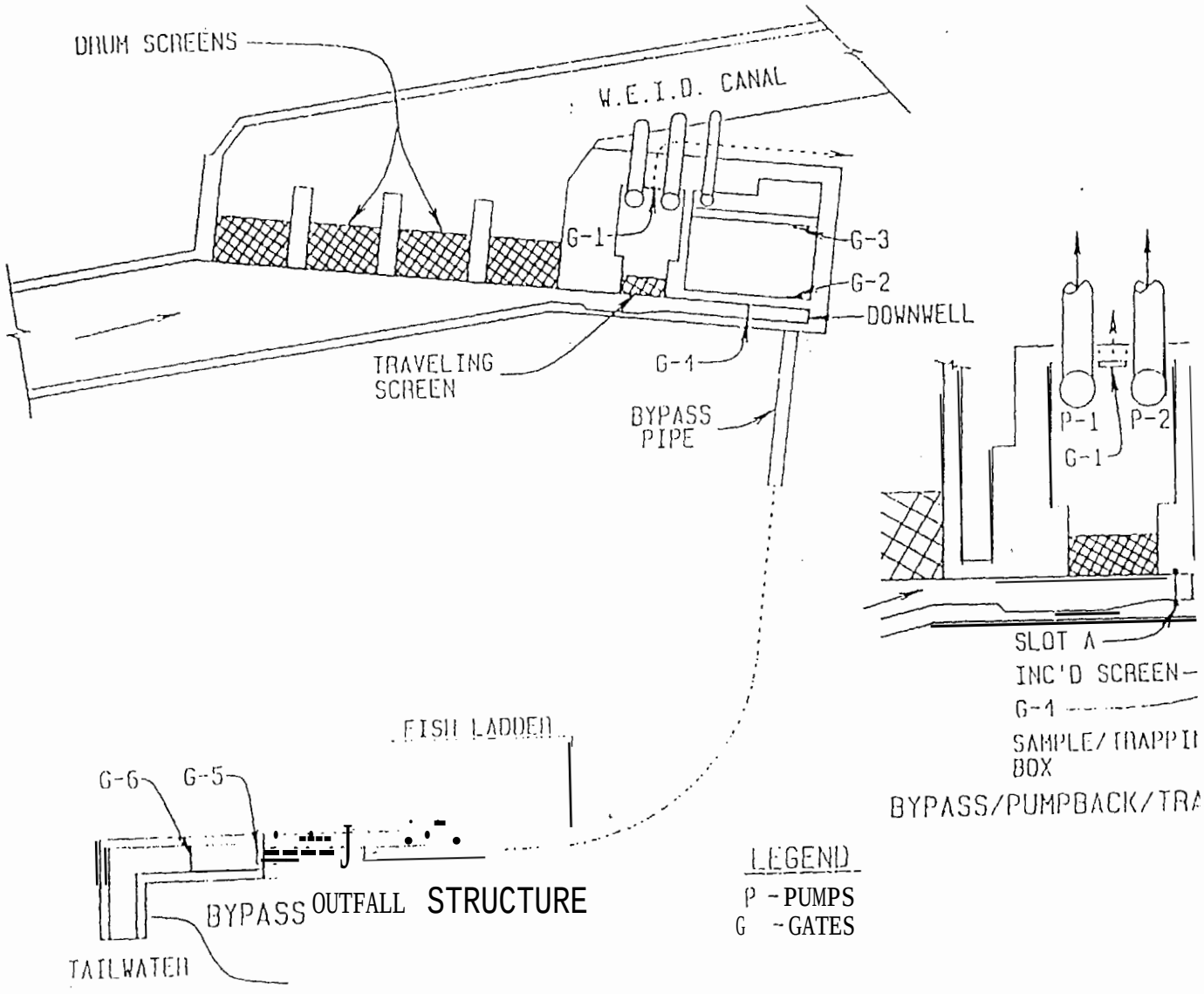

Figure 6. Threemile Dam West Bank Juvenile Facility

Information collected at Threemile Dam west bank includes dates of both canal operation and facility operational modes. The facility is not manned on a 24 hour basis.

Objective 4 - Adult and Juvenile Transportation

Task 4.1 - 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 are used as the basic guideline for adult hauling operations.

Adult transportation requirements are based on flow criteria outlined in the 1981 USFWS study and past observations of salmon migrations in the Umatilla River. The Umatilla Hatchery and Basin Annual Operations Plan (AOP)(CTUIR and ODFW 1996) also identifies criteria for transportation of adults collected at Threemile Dam. Generally, returning adults are to be hauled whenever flows in the Umatilla River are projected to fall below 150 cfs at Dillon within 30 days. Trap and Haul personnel are also responsible for collection and transportation of broodstock designated for Umatilla River production.

The AOP outlines release locations for adults hauled upstream from Threemile Dam. Fall chinook and coho are to be released at Barnhart (RM 42). Summer steelhead releases are to be alternated between Barnhart and Nolin (RM 33). Spring chinook and summer steelhead are to be released at Barnhart through May 15 or until flows at Pendleton drop below 150 cfs. Releases are then to be alternated between Thornhollow (RM 73.5) and Imeques C-mem-ini-kern (Imeques)(RM 80).

Returning adults would 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 AOP identified the following groups for release at Threemile Dam regardless of flow condition: fall chinook minijacks; excess fall chinook jacks: and excess coho adults and jacks. Spring chinook released at Threemile Dam received a caudal fin punch to identify fallbacks.

Task 4.2 - Westland Adult Hauling

Summer steelhead kelts and other adults may be captured at the Westland Canal juvenile facility during trapping operations. Adults

entering the trap can be separated from juveniles by a horizontal bar grader and directed into an adult holding pond. Kelts can then be loaded onto tanks for hauling downstream for release at the Umatilla River boat ramp. Other adults captured incidentally at Westland, such as spring chinook, are hauled upstream to natural production areas.

Task 4.3 - Westland Juvenile Hauling

In the past, a standard Neilson impellor fish pump has been borrowed from Lookinglass Hatchery and stationed at Westland for loading juveniles captured at the facility. However, with low numbers expected this year juveniles were anticipated to be loaded by dipnet rather than using the Neilson pump. There is also an experimental Pescalator rotary auger pump located at the facility.

Juvenile transportation requirements are also based on flow criteria outlined in the 1981 USFWS study and past observations of salmon migrations in the Umatilla River. In the past, 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. With flow enhancement now available to assist downstream migration, hauling of juveniles is coordinated with fish passage flow releases.

The same transport units used for adults are used for hauling juveniles. ODFW liberation protocols are also used as the basic guideline for juvenile hauling operations. Data collected for each transport includes date, transport unit, number of pounds hauled, and an estimate of mortality. Umatilla Hatchery Satellite Facility personnel collect information related to smolt outmigration such as size and species composition. All juveniles are to be released at the Umatilla River boat ramp.

Task 4.4 - Threemile Dam Juvenile Hauling

The capability exists at the Threemile Dam west bank juvenile facility to trap and haul small numbers of outmigrants. Fish are to be hauled when Phase I exchange flows and flow augmentation efforts are discontinued. If coordinated with trap operations at Westland Canal, only small numbers of smolts are present above Threemile Dam when trapping operations begin. Any juveniles hauled from the facility are to be released at the Umatilla River boat ramp.

Task 4.5 - Other Hauling Operations

Trap and Haul personnel and equipment were available for other transportation needs related to the Umatilla Basin fisheries restoration program as long as project priorities did not preclude participation.

RESULTS

Objective 1 – Passage Conditions Monitoring

Task 1.1 – Monitoring of River Conditions

Water temperature and flow, measured **at** Threemile Dam, exhibited extreme seasonal fluctuation during the year. The lowest daily mean temperature recorded was 0.2 C (32.4 F) on December 29, 1996. The highest daily mean temperature was 26.9 C (80.4 F) on August 4 and 6, 1997. Due to software difficulties, the data recorded by the Ryan TempMentor from February 11 through June 26, 1997 was unrecoverable. Temperature information for 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 2.2 cfs in July to a high of 12,407 cfs in January.

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 1 cfs in August to a high of 9,780 cfs in January. Flows **at** Yoakum ranged from 84 to 10,700 cfs and flows at Pendleton ranged from 41 to 7,790 cfs. Flow and temperature information for the project year is contained in Appendix A.

Task 1.2 – Inspection of Passage Facilities

Two main operational problems were observed during monitoring of the juvenile and adult passage facilities; the Westland ladder hydraulic gate system and an insufficient level of daily operation and maintenance at the sites. In addition, a number of smaller problems were noticed and corrected at the various sites.

Based on Phase II exchange criteria, Cold Springs Canal turned on and off a number of times during the spring. Juvenile salmonids were usually present in the canal forebay when it was dewatered. The fish were flushed directly back to the river through the bypass by lowering the canal.

Task 1.3 – Coordination of Passage Projects

Phase I of the UBP was started August 14, 1996 to provide flows for fall returning adult salmonids. It operated until October 28 when exchanges with West Extension Irrigation District (WEID) were discontinued in conjunction with the end of the WEID irrigation season. The Phase I exchange restarted the following spring to help maintain UBP target flows for adult and juvenile salmonids. It was operated from May 23 to July 7 when exchanges were discontinued for the summer.

The Phase II exchange with Hermiston Irrigation District (HID) was conducted from November 2, 1996 to June 13, 1997 to help maintain UBP target flow levels. A partial Phase II exchange of both live and stored flow with Stanfield Irrigation District (SID) was implemented beginning May 22 to help maintain UBP target flow levels and to provide additional water in McKay Reservoir for fish passage releases.

Water from McKay Reservoir was released for two periods during the project year to enhance fish passage. Water was released from September 23 to November 7, 1996 to augment flows for migrating adult salmon and steelhead. Water was also released from June 3 to June 29, 1997 to assist migration of juvenile chinook and provide passage for adult spring chinook. During the June releases, flows were doubled for two and a half days (June 23-25) to provide a pulse flow in an attempt to flush out remaining juveniles.

Ladders and bypasses were operated in conjunction with flow enhancement efforts to maximize passage conditions for both adult and juvenile salmonids.

Objective 2 – Operation of Adult Trapping Facilities

Task 2.1 – Threemile Dam Adult Trapping

Threemile Dam east bank ladder opened on August 15, 1996. Fish were trapped in the ladder using a V-trap until the steeppass and adult facility were opened on September 16. Fish trapped in the ladder were not anesthetized with C02. The ladder and adult facility operated until July 7, 1997. The ladder was reopened again on August 19, 1997. The ladder was closed for seven days in early January when the lead gate collapsed. The adult facility was closed a total of 29 days between December 30, 1996 and April 24, 1997. Silt and debris associated with high flow events were the reason for the adult facility closures.

The first returning salmon and steelhead were collected on August 30, 1996. A total of 2,477 summer steelhead; 646 adult, 80 jack and 606 subjack fall chinook: 618 adult and 24 jack coho; and 2,194 adult and four jack spring chinook were collected at Threemile Dam. Included in the spring chinook jack total were two subjacks based on size (<15") and mark. All adults were trapped at the east bank facility. The west bank adult facility was not operated again this year.

Summer steelhead were trapped from September 6, 1996 to June 30, 1997. Peak return occurred during December when 23.4% (579 of 2,477 fish) of the total return was trapped. Based on historical fork length data, 66.7% of the summer steelhead run was comprised of S1 fish and 33.3% were S2 fish.

Coho were trapped from September 19 to December 11, 1996. Peak return month for both adults and jacks was October. Of the total return, 64.4% (398 of 618 fish) of the adults and 66.7% (16 of 24 fish) of the jacks were trapped in October.

Fall chinook were trapped from August 30, 1996 to January 12, 1997. Peak return month for adults, jacks, and subjacks was October. Of the total return, 62.7% (405 of 646 fish) of the adults, 63.8% (51 of 80 fish) of the jacks and 75.4% (457 of 606 fish) of the subjacks were trapped in October.

Spring chinook were captured from April 11 to September 15, 1997. Peak return month for adults was May when 72.1% (1582 of 2194 fish) of the adults were trapped. Peak return month for jacks was June when 75.0% (3 of 4 fish) of the jacks were trapped.

There were 30 spring chinook adults sacrificed on May 14 for an Environmental Protection Agency tissue study. There were three adults and one jack were sacrificed for CWT recovery and 24 adult mortalities.

Only spring chinook were marked this year with a caudal punch to identify fallbacks. A total of 40 spring chinook fallbacks were recovered at Threemile Dam. All fallbacks were either re-released at Threemile Dam or hauled upriver depending on recapture date but were not re-recorded in the daily return summaries. Tables 1 through 4 contain a daily record of adults captured during 1996-97.

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 oregonensis), 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 included carp (Cyprinus carpio), smallmouth bass (Micropterus dolomieui), and whitefish (Prosopium williamsoni).

Task 2.2 - Westland Adult Trapping

No adult salmonids were captured at Westland this year.

Objective 3 - Operation of Juvenile Trapping Facilities

Task 3.1 - Westland Juvenile Facility Operation

Westland Canal was in operation for a total of 210 days between December 16, 1996 and July 30, 1997. The juvenile facility operated in the bypass mode for 175 days and in the trapping mode for 35 days.

Table 1. 1996 Fall Chinook Return Disposition

DATE	TRAPPED				SACRIFICED				RELEASED UPSTREAM			RELEASED @ DAM				BROOD		
	TOTAL	ADULTS	JACKS	SUBJACKS	TOTAL	ADULTS	JACKS	SUBJACKS	TOTAL	ADULTS	JACKS	TOTAL	ADULTS	JACKS	SUBJACKS	TOTAL	ADULTS	JACKS
8-30	1	1	0	0	0				1	1		0				0		
AUG	1	1	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0
9-06	1	0	0	1	0				0			1			1	0		
9-09	1	1	0	0	1	1			0			0				0		
9-12	2	2	0	0	0				2	2		0				0		
9-16	3	1	0	2	1				1	1		1			1	0		
9-17	11	6	2	3	2	1			7	5	2	2			2	0		
9-18	7	4	1	2	0				4	4		3		1	2	0		
9-19	11	4	0	7	6	1			3	3		2			2	0		
9-20	6	2	1	3	0				2	2		4		1	3	0		
9-23	25	13	5	7	2	1			0			23	12	5	6	0		
9-24	1	0	0	1	0				0			1			1	0		
9-25	4	2	1	1	0				0			2		1	1	2	2	
9-26	11	5	2	4	2				0			4		2	2	5	5	
9-27	8	1	1	6	2		1		0			5			5	1	1	
9-29	75	20	3	52	2	2			0			55		3	52	18	18	
9-30	58	18	3	37	13			1	0			24			24	21	18	3
SEP	224	79	19	126	31	6	1	2	19	17	2	127	12	13	102	47	44	3
10-01	40	5	1	34	1		1		0			34			34	5	5	
10-02	33	13	0	20	2				0			18			18	13	13	
10-03	35	11	3	21	1				0			24	1	3	20	10	10	
10-04	37	8	1	28	0				0			28			28	9	8	1
10-05	62	15	3	44	0				0			44			44	18	15	3
10-07	26	8	0	18	9				0			9			9	8	8	
10-08	25	6	3	16	0				0			19		3	16	6	6	
10-09	49	13	2	34	8				0			28		2	26	13	13	
10-10	43	11	2	30	1				0			31		2	29	11	11	
10-11	61	27	6	28	0				0			34	2	4	28	27	25	2
10-12	85	59	2	24	0				0			29	3	2	24	58	56	
10-13	36	18	2	16	0				0			18		2	16	18	18	
10-14	33	8	3	22	17			1	0			8		3	5	8	8	
10-15	33	20	2	11	4				0			9		2	7	20	20	
10-16	27	18	3	6	0				0			9		3	6	18	18	
10-17	19	12	1	6	0				0			7		1	6	12	12	
10-18	8	3	1	4	1				0			4		1	3	3	3	
10-20	31	15	0	16	0				0			16			16	15	15	
10-21	18	12	0	6	4				0			10	8		2	4	4	
10-22	12	5	1	6	1				0			7	2		5	4	3	1
10-23	14	3	1	10	2				0			9	1		8	3	2	1
10-24	13	5	1	7	3				0			5	1		4	5	4	1
10-25	25	14	1	10	0				0			16	6		10	9	8	1
10-26	26	22	0	4	0				0			11	7		4	15	15	
10-27	35	25	1	9	0				0			14	4	1	9	21	21	
10-28	18	10	2	6	2				0			9	5		4	7	5	2
10-29	19	10	4	5	0				0			11	6		5	8	4	4
10-30	26	14	3	9	5				0			7	1	2	4	14	13	1
10-31	24	15	2	7	0				0			10	1	2	7	14	14	
OCT	913	405	51	457	61	0	1	1	0	0	0	478	48	33	397	374	357	17
11-01	16	12	1	3	0				0			4		1	3	12	12	
11-02	8	6	0	2	0				0			4	2		2	4	4	
11-03	7	6	1	0	0				0			1		1		6	6	
11-04	4	3	0	1	0				0			2	1		1	2	2	
11-05	14	11	1	2	0				0			6	3	1	2	8	8	
11-06	18	14	2	2	0				0			5	2	1	2	13	12	1
11-07	16	14	1	1	0				0			1			1	15	14	1
11-08	11	8	0	3	0				0			3			3	8	8	
11-10	39	37	0	2	0				0			2			2	37	37	
11-11	11	10	0	1	0				0			1			1	10	10	
11-12	2	2	0	0	0				0			0				2	2	
11-13	4	4	0	0	0				0			0				4	4	
11-15	10	7	1	2	0				0			2			2	8	7	1
11-18	24	18	2	4	2				0			2			2	20	18	2
11-20	4	4	0	0	0				0			0				4	4	
11-24	2	2	0	0	0				0			0				2	2	
NOV	190	158	9	23	2	0	0		0	0	0	33	8	4	21	155	150	5
12-02	1	1	0	0	1	1			0			0				0		
12-09	1	1	0	0	0				0			1	1			0		
DEC	2	2	0	0	1	1	0		0	0	0	1	1	0	0	0	0	0
1-10	1	1	0	0	0				0			1	1			0		
1-12	1	0	1	0	0				0			1		1		0		
JAN	2	1	1	0	0	0	0		0	0	0	2	1	1	0	0	0	0
TOTAL	1332	646	80	606	95	7	2		20	18	2	641	70	51	520	576	551	25

Table 2. 1996 Coho Return Disposition

DATE	TRAPPED TOTAL	TRAPPED AOULTS	TRAPPED JACKS	SACRIFICED TOTAL	SACRIFICED ADULTS	SACRIFICED JACKS	RELEASEDUPSTREAM TOTAL	RELEASEDUPSTREAM AOULTS	RELEASEDUPSTREAM JACKS	RELEASED@ DAM TOTAL	RELEASED@ DAM ADULTS	RELEASED@ DAM JACKS
9-16	1	1	0	0			1	1		0		
9-17	1	1	0	0			1	1		0		
9-18	4	2	2	0			2	2		2		2
9-19	1	1	0	0			1	1		0		
9-23	2	1	1	0			0			2	1	1
Q-26	1	1	0	0			0			1	1	
Q-27	2	2	0	0			0			2	2	
9-29	8	5	3	0			0			8	5	3
Q-30	7	5	2				0			6	4	2
SEP	27	19	8	1	1	0	5	5	0	21	13	8
10-01	11	8	3	0			0			11	8	3
10-02	5	4	1	0			0			5	4	1
10-03	6	4	2	1	1		0			5	3	2
10-04	6	4	2	0			0			6	4	2
10-06	10	9	1	0			0			10	9	1
10-07	4	3	1	0			0			4	3	1
10-08	6	6	0	0			0			6	6	
10-09	8	7	1	0			0			8	7	1
10-10	10	7	3	0			0			10	7	3
IO-11	14	14	0	0			0			14	14	
IO-12	33	33	0	0			0			33	33	
10-13	25	24	1	0			0			25	24	1
10-14	10	10	0	2	2		0			8	8	
IO-15	9	8	1	0			0			9	8	1
10-16	7	7	0	0			0			7	7	
10-17	4	4	0	0			0			4	4	
10-18	3	3	0	0			0			3	3	
10-20	4	4	0	0			0			4	4	
10-21	7	7	0	0			0			7	7	
10-22	11	11	0	1	1		0			10	10	
10-23	14	14	0	1	1		0			13	13	
10-24	12	12	0	0			0			12	12	
10-25	19	19	0	0			0			19	19	
10-26	20	20	0	0			0			20	20	
IO-27	27	27	0	0			0			27	27	
10-28	13	13	0	2	2		0			11	11	
IO-29	8	8	0	0			0			8	8	
10-30	32	32	0	3	3		0			29	29	
10-31	76	76	0	2	2		0			74	74	
OCT	414	396	16	12	12		0	0		402	386	16
11-01	48	46	0	0			0			48	48	
11-02	16	16	0	0			0			16	16	
11-03	3	3	0	0			0			3	3	
11-04	2	2	0	0			0			2	2	
11-05	3	3	0	0			0			3	3	
11-06	5	5	0	0			0			5	5	
11-07	6	6	0	0			0			6	6	
11-08	4	4	0	0			0			4	4	
11-10	7	7		0			0			7	7	
11-11	1	1		0			0			1	1	
11-12	1	1		0			0			1	1	
11-13	1	1		0			0			1	1	
11-15	2	2	0	0			0			2	2	
11-18	5	5	0	0			0			5	5	
11-20	1	1	0	0			0			1	1	
11-21	13	13	0	0			0			13	13	
11-22	17	17	0	2	2		0			15	15	
11-24	22	22	0	0			0			22	22	
11-2:	4	4	0	3	3		0			1	1	
11-27	1	1	0	0			0			1	1	
11-29	16	16	0	0			0			16	16	
NOV	178	178	0	5	5		0	0		173	173	
12-o;	21	21	0	2	2		0			19	19	
12-1'	2	2		0			0					
DEC	23	23		2	2		0	0				
TOTAl	642	618	2	20	20		5	5			593	

Table 3. 1996–97 Summer Steelhead Return Disposition

DATE	TRAPPED TOTAL	TRAPPED HATCHERY	TRAPPED WILD	SACRIFICED/MORTALITIES TOTAL	SACRIFICED/MORTALITIES HATCHERY	SACRIFICED/MORTALITIES WIL	RELEASED UPSTREAM TOTAL	RELEASED UPSTREAM HATCHERY	RELEASED UPSTREAM WILC	RELEASEDQDAM TOTAL	RELEASEDQDAM HATCHERY	RELEASEDQDAM WILD	BROOD TOTAL	BROOD HATCHERY	BROOD WJLO
9–05	1	1	0	0			1	1		0			0		
S-16	1	1	0	0			1	1		0			0		
9–17	5	3	2	0			5	3	2	0			0		
9-16	3	3	0	0			3	3		0			0		
9–18	3	2	1	0			3	2	1	0			0		
s-23	2	1	1	0			0			2	1	1	0		
S-24	1	1	0	0			0			1	1		0		
9-25	1	1	0	0			0			1	1		0		
9-26	3	2	1	0			0			3	2	1	0		
9–27	2	1	1	0			0			2	1	1	0		
9-29	6	4	2	0			0			6	4	2	0		
9-30	1	1	0	0			0			1	1		0		
SEP	29	21	8	0	0		13	10	:	16	11	5	0	0	C
IO-01	3	1	2	0			0			3	1	2	0		
IO-02	1	1	0	1	1		0			0			0		
IO-03	2	2	0	0			0			2	2		0		
IO-04	6	4	2	0			0			6	4	2	0		
IO-06	12	6	6	0			0			12	6	6	0		
IO-07	7	5	2	2	2		0			5	3	2	0		
IO-06	1	1	0	0			0			1	1		0		
10–09	7	5	2	2	2		0			5	3	2	0		
IO-IO	6	5	1	1	1		0			5	4	1	0		
IO-II	3	3	0	0			0			3	3		0		
IO-12	11	8	3	0			0			11	a	3	0		
IO-13	9	3	6	0			0			6	3	3	3		
IO-14	a	6	2	1	1		0			7	5	2	0		
IO-15	10	9	1	2	2		0			8	7	1	0		
IO-16	7	2	5	0			0			7	2	5	0		
10-17	7	5	2	0			0			7	5	2	0		
IO-16	7	7	0	3	3		0			4	4		0		
10–20	1	1	0	0			0			1	1		0		
IO-21	10	6	4	3	3		0			6	3	3	1		
IO-22	3	2	1	0			0			3	2	1	0		
IO-23	11	5	6	1	1		0			10	4	6	0		
IO-24	6	5	1	2	2		0			4	3	1	0		
IO-25	5	5	0	0			0			5	5		0		
10-26	6	3	3	0			0			6	3	3	0		
IO-27	6	2	4	0			0			6	2	4	0		
10–28	2	0	2	0			0			0			2		
IO-29	2	2	0	0			0			2	2		0		
IO-30	7	3	4	0						7	3	4	0		
IO-31	8	6	2	2	2		0			6	4	2	0		
OCT	174	113	61	20	20		0	0		148	93	55	6	0	
II-01	2	2	0	0			0			2	2		0		
11-M	4	1	3	0			0			1		1	3	1	
11–05	1	1	0	0			0			1	1		0		
II-06	8	2	6	0			0			6	2	4	2		
II-07	6	5	1	0			0			6	5	1	0		
II-08	a	5	3	3	3		0			5	2	3	0		
II-IO	2	2	0	0			0			2	2		0		
11–11	1	1	0	0			0			1	1		0		
11-12	2	2	0	0			0			2	2		0		
II-13	2	1	1	1			0			1		1	0		
II-IS	1	1	0	0			0			1	1		0		
11–20	1	1	0	0			0			1	1		0		
II-22	2	0	2	0			0			2		2	0		
II-24	10	5	5	0			0			10	5	5	0		
11-25	5	0	5	0			0			5		5	0		
II-26	2	1	1	1			0			1		1	0		
II-27	4	2	2	0			0			4	2	2	0		
11-2s	33	22	11	0			0			33	22	11	0		
NOV	94	54	40	5	5		0	0		84	48	36	5	1	
12-02	76	37	39	5	5		0			64	31	33	7	1	
12–03	12	4	8	0			0			12	4	a	0		
12-ws	6	3	5	0			0			8	3	5	0		
12–05	2	1	1	0			0			2	1	1	0		
12-M	1	0	1	0			0			1		1	0		
12-G?)	61	33	26	0			0			57	33	24	4		
12–10	16	13	3	7	7		0			9	6	3	0		
12–11	S	4	5	1	1		0			6	3	5	0		
12–12	tl	4	4	0			0			a	4	4	0		
12–13	21	12	0	3	3		0			16	S	9	0		
12–14	41	21	20	0			0			41	21	20	0		
12–15	17	11	6	0			0			17	11	6	0		
12–16	30	18	12	6	6		0			17	11	6	7	1	
12–17	26	12	14	0			0			26	12	14	0		
12–19	2	1	1	0			0			2	1	1	0		
12-z2	12	13	8	0			0			21	13	a	0		
12-2:3	20	ii	M6	3	3		0			9	3	6	0		
12–26				0			0			20	6	14	0		
12–30	1	1	0	0			0			1	1	0	0		
DEC	384	200	184	25	25		0	0		341	173	168	16	2	16
I-IO)	89	48	41	2	2		0			76	45	31	11	1	10
1–11	264	131	133	0			0			264	131	133	0		
1-12)	140	78	62	0			0			140	70	62	0		
1-1?)	37	-20	17	17	17		0			6	2	4	14	1	13
1-21	9	5	4	2	2		0			7	3	4	0		
1–22	11	5	6	0			0			S	5	4	2		2
1–23	Q	5	4	0			0			9	5	4	0		
1-24)	10	2	8	0			0			5	2	3	5		5
1-27	7	7	0	0			0			7	7		0		
1-31	3	3	0	0			0			3	3		0		
JAN	57s	304	275	21	21		0	0		526	281	245	32	2	30

Table 3. (continued)

2-10	a	4	4	2	2		0			6	2	4	0			
2-11	3	3	0	0			0			3	3		0			
2-12	4	3	1	0			0			4	3	1	0			
2-13	14	7	7	1		1	0			8	6	2	5	1		4
2-14	9	7	2	4	4		0			5	3	2	0			
2-15	42	26	16	0			0			42	26	16	0			
2-17	42	26	16	1		1	0			41	26	15	0			
2-18	136	77	58	5	2	3	0			122	74	48	9	1		8
2-19	15	11	4	0			0			15	11	4	0			
2-20	48	33	15	0			0			48	33	15	0			
2-21	11	7	4	0			0			11	7	4	0			
2-23	16	14	4	0			0			18	14	4	0			
2-24	12	6	6	2	2		0			6	4	2	4			4
2-25	10	5	5	0			0			10	5	5	0			
2-26	30	20	10	0			0			30	20	10	0			
2-27	35	22	13	0			0			31	22	9	4			4
2-26	17	15	2	0			0			17	15	2	0			
FEE	454	266	166	15	10	5	0	0	0	417	274	143	22	2		20
3-02	18	12	6	0			0			18	12	6	0			
3-03	6	6	2	2	2		0			6	4	2	0			
3-05	6	2	4	0			0			6	2	4	0			
3-06	6	5	1	0			0			6	5	1	0			
3-07	21	12	9	0			0			21	12	9	0			
3-08	33	16	15	0			0			33	16	15	0			
3-10	42	28	14	1	1		0			36	28	10	5	1		4
3-11	3	2	1	0			0			3	2	1	0			
3-17	61	38	23	2	2		0			59	36	23	0			
3-25	120	75	45	2	2		0			116	73	45	0			
3-26	50	33	17	0			0			41	32	9	9	1		8
3-27	41	26	15	0			0			41	26	15	0			
3-26	7	4	3	0			0			7	4	3	0			
3-30	44	30	14	0			0			44	30	14	0			
3-31	31	19	12	2	2		0			26	17	9	3			3
MAR	491	310	181	9	9	0	0	0	0	465	299	166	17	2		15
4-01	14	11	3	0			0			14	11	3	0			
4-02	9	7	2	0			0			9	7	2	0			
4-M	12	5	7	0			0			10	5	5	2			2
4-04	23	17	6	0			0			23	17	6	0			
4-06	12	7	5	0			0			12	7	5	0			
4-07	9	5	4	2	2		0			4	3	1	3			3
4-08	7	6	1	0			0			7	6	1	0			
4-09	5	3	2	0			0			5	3	2	0			
4-10	5	4	1	0			0			5	4	1	0			
4-11	6	5	1	0			0			6	5	1	0			
4-14	14	9	5	2	2		0			12	7	5	0			
4-15	5	4	1	0			0			5	4	1	0			
4-16	6	4	2	0			0			6	4	2	0			
4-17	9	6	3	0			0			9	6	3	0			
4-16	6	4	2	0			0			6	4	2	0			
4-20	19	11	8	0			0			19	11	8	0			
4-26	30	20	10	0			0			30	20	10	0			
4-28	34	16	16	1	1		0			29	15	14	4			
4-29	6	5	1	0			0			6	5	1	0			
4-30	3	1	2	0			0			3	1	21	0			
APR	234	150	84	5	5	0	0	0	0	220	145	75	9	0		9
5-01	6	5	3	0			0			7	4	3	1	1		
5-03	1	1	0	0			0			1	1		0			
5-04	2	2	0	0			0			2	2		0			
5-05	3	1	2	0			0			3	1	2	0			
5-06	2	1	1	0			0			2	1	1	0			
5-07	2	1	1	0			0			2	1	1	0			
5-09	2	1	1	0			0			2	1	1	0			
5-11	1	1	0	0			0			1	1		0			
5-14	1	0	1	0			0			1		1	0			
5-15	1	0	1	0			0			1		1	0			
5-18	1	0	1	0			0			1		1	0			
5-21	2	1	1	0			0			2	1	1	0			
5-23	1	0	1	0			0			1		1	0			
5-24	1	1	0	0			0			1	1		0			
5-25	1	1	0	0			0			1	1		0			
MAY	29	16	13	0	0	0	0	0	0	26	15	13	1	1		
6-06	2	2	0	0			2	2		0			0			
6-13	1	1	0	0			1	1		0			0			
6-15	3	3	0	0			3	3		0			0			
6-20	1	1	0	0			1	1		0			0			
6-23	1	1	0	0			1	1		0			0			
6-30	1	1	0	0			1	1		0			0			
JUN	9	9	0	0	0	0	9	9	0	0	0	0	0	0		0
TOTAL	2477	1463	1014	100	95	5	22	19	3	2245	1339	906	110	10		100

Table 4. 1993 Spring Chinook Return Disposition

DATE	TRAPPED TOTAL	TRAPPED ADUTS	TRAPPED JACKS	SACRIFICED/MORTALITIES TOTAL	SACRIFICED/MORTALITIES ADULTS	SACRIFICED/MORTALITIES JACKS	RELEASED UPSTREAM TOTAL	RELEASED UPSTREAM ADUTS	RELEASED UPSTREAM JACKS	RELEASED @ DAM TOTAL	RELEASED @ DAM ADUTS	RELEASED @ DAM JACKS	BROOD TOTAL	BROOD ADUTS	BROOD JACK'
4-11	1	1	0	0			0			1	1		0		
4-15	1	1	0	0			0			1	1		0		
4-16	1	1	0	0			0			1	1		0		
4-18	2	2	0	0			0			2	2		0		
4-20	4	4	0	0			0			4	4		0		
4-26	2	2	0	0			0			2	2		0		
4-28	54	54	0	0			0			54	54		0		
4-29	4	4	0	0			0			4	4		0		
4-30	35	35	0	0			0			35	35		0		
APR	104	104	0	0	0	0	0	0	C	104	104	0	0	0	
5-01	31	31	0	0			0			31	31		0		
5-02	29	29	0	0			0			22	29		0		
5-03	36	38	0	0			0			38	38		0		
5-04	46	46	0	1	1		0			45	45		0		
5-05	45	45	0	0			0			20	20		25	25	
5-06	46	46	0	0			0			6	6		40	40	
5-07	26	26	0	0			0			26	26		0		
5-08	29	29	0	0			0			29	29		0		
5-09	64	64	0	0			0			10	10		54	54	
5-10	51	51	0	0			0			51	51		0		
5-11	116	116	0	0			0			116	116		0		
5-12	45	45	0	0			0			7	7		38	38	
5-13	79	79	0	1	1		0			11	11		67	67	
5-14	76	76	0	30	30		0			46	46		0		
5-15	58	58	0	1	1		0			6	6		49	49	
5-16	107	107	0	0			0			107	107		0		
5-17	94	94	0	1	1		0			93	93		0		
5-18	62	62	0	0			0			62	62		0		
5-19	38	36	0	0			0			6	6		32	32	
5-20	85	85	0	0			0			5	5		a0	80	
5-21	53	53	0	0			0			53	53		0		
5-22	57	57	0	0			0			6	6		51	51	
5-23	55	55	0	0			0			55	55		0		
5-24	57	57	0	0			0			57	57		0		
5-25	32	32	0	0			0			32	32		0		
5-26	38	38	0	0			0			36	38		0		
5-27	46	46	0	1	1		0			6	a		37	37	
5-28	35	35	0	4	4		0			4	4		27	27	
5-29	23	23	0	0			16	16		7	7		0		
5-30	21	21	0	1	1		0			20	20		0		
MAY	1582	1582	0	40	40		16	16		1026	1026	(	500	500	
6-02	38	38	0	1	1		20	20		0			17	17	
6-04	63	63	0	1	1		23	23		0			39	39	
6-06	95	95	0	2	2		93	93		0			0		
6-09	62	62	0	1	1		29	29		0			32	32	
6-10	29	29	0	2	2		27	27		0			0		
6-11	14	14	0	1	1		13	13		0			0		
6-12	12	12	0	3	3		9	9		0			0		
6-13	30	30	0	0			30	30		0			0		
6-15	20	28	0	0			26	26		0			0		
6-16	21	21	0	1	1		6	6		0			12	12	
6-17	4	4	0	0			4	4		0			0		
6-20	15	15	0	0			15	15		0			0		
6-23	34	33	1	1	1		33	32		0			0		
6-24	16	16	0	0			16	16		0			0		
6-25	14	13	1	0			14	13		0			0		
6-26	10	9	1	1	1		9	8		0			0		
6-27	7	7	0	0			7	7		0			0		
6-30	10	10	0	0			10	10		0			0		
JUN	502	499	3	[redacted]			388	385		0	0		100	100	
7-03	6	6	0	1	1		5	5		0			0		
JUL	6	6	0	1	1		5	5		0	0		0	0	
8-26	2	1	1	1			1	1		0			0		
AUG	2	1	1	1	0		1	1		0	0		0	0	
9-02	1	1	0	1	1		0			0					
9-15	1	1	0	1	1		0			0			0		
SEP	2	2	0	2	2		0	0		0	0		0	0	
TOTAL	2198	2194	[redacted]	[redacted]			410	407		1130	1130		600	600	

"The following number of fish recorded as adults in the summary table based on mark (RV or ADRV) were jacks by size (<24, 610mm): 5-12 (1), 5-22 (1), 5-26 (1), 6-06 (1), and 6-12 (1)

"The following number of fish recorded as jacks in the summary table were actually mini-jacks by mark (RV or ADRV) and size (<15", 381mm): 6-26 (1) and 8-26 (1).

Westland Canal opened for groundwater recharge deliveries on December 16, 1996 and switched from winter recharge to standard irrigation delivery on April 2, 1997. Natural and enhanced river flow levels were adequate to continue operation of the juvenile bypass for downstream migration until June 26 when it was closed and the trap opened in preparation for discontinuation of flow augmentation measures on June 29. Trap and haul operations continued for the remainder of the outmigration season until the facility was closed on July 30.

A combination of high spring flows and flow enhancement releases from McKay Reservoir for juvenile and adult fish passage resulted in relatively low numbers of juvenile salmonids being captured at the Westland facility 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), speckled dace (Rhinichthys osculus), black crappie (Pomoxis nisromaculatus), and brown bullhead (Ictalurus nebulosus).

Task 3.2 – Threemile Dam Juvenile Facility Operation

The Threemile Dam west bank juvenile bypass was open from October 4 to November 1, 1996 when the canal headworks were closed for off season maintenance of the canal. The bypass was operated at 25 cfs when initially opened but increased to 35 cfs on October 7. It was operated in the 35 cfs mode until closed on November 1. The bypass was re-opened in the 35 cfs mode on March 26, 1997 in conjunction with WEID beginning spring operations. It operated in the 35 cfs mode until June 30. At that time, the bypass flow was reduced to 5 cfs as McKay flows were discontinued. The bypass continued to operate until July 7 when Phase I exchanges were terminated for the summer.

Natural and enhanced flows allowed all fish to be bypassed at the facility until July 7 when the facility was closed for the summer. No juveniles were observed at the facility when it was shut down. The trap was not operated this year.

Objective 4 – Adult and Juvenile Transportation

Task 4.1 – Threemile Dam Adult Hauling

Of the fish trapped at Threemile Dam, 22 summer steelhead; 18 adult and two jack fall chinook: five adult coho; and 407 adult and three jack spring chinook were hauled upstream. There were 110 summer steelhead hauled to Minthorn for brood and 551 adult and 25 jack fall chinook transferred to the Threemile Dam Fall Chinook Holding and Spawning Facility for brood. In addition, 600 spring chinook were collected for broodstock this year. Of these, 473 were initially held at the Threemile Dam brood facility prior to completion of the South Fork Walla Walla Spring Chinook Holding and

Spawning Facility (South Fork). and 127 were hauled directly to the South Fork facility from the Threemile Dam trap.

A total of 58 loads of fish were transported by the project from Threemile Dam on 54 days. The 3,000 gallon liberation unit was used for 26 trips and one of the 370 gallon units was used for 32 trips. Four double haul trips were made with the tanker to the South Fork brood facility and Thornhollow release site. The totals also include three trips made by the project from the Threemile Dam brood facility. Not included in the totals are two trips made from the Threemile Dam brood facility to the South Fork brood facility with spring chinook broodstock by ODFW with a regional tanker trailer unit.

Summer steelhead adults were hauled upstream from Threemile Dam 11 days between September 6, 1996 and June 30, 1997. There were also 23 trips made to Minthorn holding pond with broodstock between October 13 and May 1. Fall chinook were hauled upstream from Threemile Dam seven days from August 30 to November 26, 1996. Coho . adults were hauled upstream on four days from September 16 to 19. Spring chinook were hauled upstream from Threemile Dam 21 days between May 29 and August 26, 1997. There were also four trips made to the South Fork facility with broodstock from May 28 to June 16.

Three trips were made by Trap and Haul and two by ODFW NE Region transportation units from the Threemile Dam brood facility. Trap and Haul transported and released 49 excess fall chinook brood from the facility at Barnhart on November 26. Trap and Haul and ODFW NE Region each made two trips from the facility to the South Fork brood facility with spring chinook broodstock. A total of 455 spring chinook brood were transported in four trips between June 3 and June 9.

Only three upriver release sites were used during 1996-97; Barnhart, Thornhollow, and North Fork Meacham Creek. Fish condition at release generally appeared good this year. No adult mortalities were observed upon release. Adult hauling information, including dates, temperatures, liberation units used and release sites is included in Appendix B.

In addition to the fish hauled upstream, there were 2,245 summer steelhead; 70 adult, 51 jack and 520 subjack fall chinook: 593 adult and 24 jack coho; and 1,130 adult spring chinook released into the forebay at Threemile Dam.

Summer steelhead adults were released at Threemile Dam on 148 days between September 23, 1996 and May 25, 1997. Fall chinook were released at Threemile Dam on 57 days between September 6, 1996 and January 12, 1997. Coho were released at Threemile Dam on 58 days between September 18 and December 11, 1996. Spring chinook were released at Threemile Dam on 39 days between April 11 and May 30, 1997. Table 5 includes release location and number by species.

A total of 11 spring chinook mortalities were observed upon release at Threemile Dam and two at Thornhollow. No mortalities were observed from the broodstock loads hauled to the South Fork facility. No other adult release mortalities were observed at either Threemile Dam or the upriver release sites.

Task 4.2 – Westland Kelt Hauling

No summer steelhead kelts or spring chinook fallbacks were hauled from Westland this year.

Task 4.3 – Westland Juvenile Hauling

A total of 17 loads of juveniles were hauled from Westland on 17 days between June 27 and July 30, 1997. The 3,000 gallon tanker was used for one load and one of the 370 gallon liberation units was used for 16 loads.

High spring flows and McKay water releases through the month of June during the peak fall chinook subyearling outmigration period limited the number of juveniles captured at Westland this year. An estimated 1,675 pounds of fish were hauled from the facility. Based on species composition sampling conducted by Umatilla Hatchery Satellite Facility personnel, approximately 80% 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 C. All juveniles hauled from Westland were released at the Umatilla River boat ramp.

Task 4.4 – Threemile Dam Juvenile Hauling

No juveniles were transported from Threemile Dam this year.

Task 4.5 – **Other Hauling Operations**

Trap and Haul personnel and equipment were used this year to haul excess fall chinook adults from Priest Rapids Hatchery to the Umatilla River. A total of 712 fall chinook were transported in six trips. The Trap and Haul 3,000 gallon tanker was used for five of the trips and ODFW NE Region made the other trip. There were 75 adults released at the ODFW District Office and the rest were released at Barnhart. Approximately 30-50 mortalities were observed upon release.

Table 5. Number of adult fish released at each location in 1996-97.

Release Site	Total Days Released	Total Fish Released	Summer Steelhead Released	Spring Chinook Released	Fall Chinook Released	Cohc Releasec
Barnhart 1/	8	86	13	0	68	5
Thornhollow	20	404	9	394	1	0
North Fork Meacham Creek	1	16	0	16	0	0
South Fork Walla Walla 2/	9	582	0	582	0	0
Minthorn Brood Pond	23	110	110	0	0	0
Threemile Dam Forebay	175	4633	2245	1130	641	617
Total	236	5831	2377	2122	710	622

l/The Barnhart fall chinook total includes 49 excess brood hauled from the Threemile Dam fall chinook holding facility.

2/ The figures for the South Fork include number of trips and fish hauled by both Trap and Haul and ODFW NE Region from both the Threemile Dam trap and fall chinook holding facility.

Table 6. Species composition of fish samoled at Westland iuvenile facility in 1997.

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		
6-30	330	35.2	0	329	0	0	0	0	0	1
7-03	318	37.1	0	317	0	0	1	0	0	0
7-10	309	30.1	0	295	0	0	6	2	0	6
7-14	323	22.9	0	299	0	0	8	3	0	13
7-17	189	21.1	0	170	0	0	11	0	0	8
7-24	238	15.1	0	71	0	0	10	1	0	156
7-28	307	15.0	0	75	0	0	13	0	0	219
Total	2014	- - -	0	1556	0	0	49	6	0	403

DISCUSSION

Objective 1 – Passase Conditions Monitoring

Task 1.1 – Monitoring of River Conditions

The accuracy and timeliness of flow data from the Hydromet gauging stations continues to be adequate for most fish passage decisions. There are still concerns at times with the accuracy of the flow readings from the Dillon gauge site. This gauge site remains the most important point for making fish passage decisions as it is located downstream of the major diversions and at what is normally the low flow point of the river. Decisions of when to implement UBP exchanges, when to augment stream flows for passage, whether to trap or bypass smolts, where to release adults, how to operate fish passage facilities, and at what flows adults and juveniles can effectively migrate are all made based on information from this gauging station.

Task 1.2 – Inspection of Passage Facilities

The inadequate level of daily operation and maintenance performed by the UPFO&M project continued to be a major concern again this year. The lead gate collapse at Threemile Dam was solely the result of insufficient maintenance and required that the ladder be shut down for a week. The struggle for control of the UPFO&M project between BOR and the irrigation districts resulted in inefficiency and inadequacy in fulfilling the daily operation and maintenance needs at the lower river passage facilities. This was a major problem during the project year and needs to be corrected.

The other main concern identified again this year was with the Westland hydraulic ladder gate system. The hydraulic problem was finally corrected in March. Spring flooding and the associated gravel deposition caused the attraction weir gate to be inoperable which precluded the ladder from being operated according to criteria. All the other ladders remained open throughout the passage season and were able to operate within criteria. Flooding did cause some superficial damage at these other ladder sites but no major damage was incurred.

There were no adult passage problems observed at Feed Canal diversion dam. Even though a number of high flow events occurred again this year, gravel deposition was much less severe as the river channel maintained itself on the north side (nearest the ladder and headworks). Gravel deposits in front of the headworks only needed to be moved once this year during the passage season. Only on one day were any significant numbers of adults observed at the dam and they were concentrated near the ladder.

A series of barbs were installed below Westland Dam in fall 1996 to stabilize the stream bank and prevent the river channel

from cutting behind the bypass outfall. The barbs appear to have helped the bypass outfall situation as the river channel stayed in the same position along the outfall preventing it from plugging with gravel and becoming isolated from the main channel as in past years. The bypass partially plugged on only one occasion even though there were a number of high flow events again this year.

The barbs did not prevent further erosion of the downstream bank area below the bypass outfall. The landowner has denied access to the Westland facility for heavy equipment until the problem is fully addressed.

The diversion dam at Westland also had to be rebuilt in the fall of 1996 due to damage sustained from the 1996 spring floods. A new jump pool was added during dam reconstruction. It appeared to operate fine with the exception that it catches large amounts of debris during high flow events. The position of the jump pool away from the bank prevents the debris from being removed except during moderate flow periods. Westland Irrigation District (WID) personnel cleaned both the jump pool and bypass outfall in late May.

The spring high water did move the channel at the Dillon Diversion Dam isolating the west bank ladder from the main river flow. Project 'personnel, in conjunction with the ditch operator, opened the east bank ladder to provide adult passage past the diversion. This was the first time the east bank ladder had been opened in recent years.

In past annual reports a concern had been expressed with ODFW screen personnel removing screens from small irrigation diversions outside normal irrigation season (late fall through early spring). The practice was discontinued by ODFW for a couple years but again this year the screens were removed. This practice provides two potential opportunities for loss of smolts; first, some ditches deliver water during the off season to water cattle and second, some screens are not replaced prior to spring irrigation deliveries starting. In both cases, ditches are running unscreened which may result in a loss of smolts. Both of these situations occurred this year and Trap and Haul recommends that this practice again be discontinued by ODFW.

Though the McKay Creek barrier weir was in operation the entire project season, operation and maintenance problems resulted in it being ineffective for long periods. It is very difficult to effectively clean the weir without a catwalk or some other type of access being available. This causes the weir to load up with debris and submerge until it can be accessed for cleaning. At other times, the weir-has been lowered for extended periods during higher flow releases from McKay Reservoir to minimize debris accumulations. In either case, the weir was ineffective for most of the winter and spring and most likely allowed both steelhead and spring chinook adults to enter the creek again this year. A meeting was held in

April and BOR was supposed to address the weir cleaning problems. However, nothing has been heard from BOR since that meeting and it is unlikely that they will provide any solution for the upcoming project season.

Task 1.3 – Coordination of Passage Projects

The Phase I exchange with WEID continued this year. There were a few concerns with the startup of Phase I this spring. New people were involved with the exchange for both WEID and BOR and there were some miscommunication and/or misunderstanding regarding how the exchange was to operate. The problems were ironed out and the exchange generally operated well again this year. It would be nice to have an operating plan similar to the AOP that covers all phases of the Basin Project to provide a reference source for instances where new people are involved or questions are raised related to exchange operations.

The Phase I exchange was continued for one additional week this year due to extended return of spring chinook adults. Normally Phase I is discontinued June 30 but this year we requested that it continue until July 7 since spring chinook returns during the last week in June averaged about 10 per day.

WEID used their lower river pump station this year for the first time since Phase I was completed. Disagreements between WEID and BOR regarding conjunctive use rates led WEID to operate the lower river pump station to provide water for its additional irrigation needs. Although there was no indication of fish loss at the WEID pump station there are still major concerns with the juvenile fish screens at the site. An associated benefit of Phase I was to provide a source of additional water to WEID so they could abandon use of these lower river pumps. Hopefully, agreement can be reached between the parties to resolve this issue so this, pump station will not be used again in the future.

Both the HID and SID portions of the Phase II exchange ran smoother this year. There was some question this spring if the SID portion of the exchange could be implemented since there was not concensus between the parties on an interim exchange agreement. A tentative agreement was reached allowing the exchange to proceed. Another question raised was related to the order in which the various components of the exchange should be implemented. Again, an annual operating plan for the Basin Project would help resolve a number of these questions.

McKay Reservoir fish passage flow releases were delayed for about one week in the fall of 1996. The instream work on the dam and barbs at Westland Dam was not completed and the contractors asked us to delay water releases until the work was completed.

As additional water becomes available for fish passage through the completion of Phase II, spring passage releases can be extended and/or increased. This spring, for the first time since the Umatilla River reestablishment program was begun, spring chinook adults were released at Threemile Dam in significant numbers to allow volitional upstream migration rather than rely on artificial transportation. This was possible because storage water exchanged through the Basin Project was available to guarantee adequate flow levels through the month of June.

Water was released from McKay Reservoir for nearly the entire month of June to facilitate passage of both juveniles and adults. In addition, flows were "pulsed" from June 23 to June 25 by increasing storage releases from 150 cfs to 300 cfs in an attempt to flush out remaining juveniles and to attract late returning spring chinook adults. It is difficult to tell if any benefits were realized from these "pulse" flows.

Coordination and cooperation amongst the various UBP entities and the irrigation districts is critical for ensuring adequate fish passage conditions exist in the lower river. The Basin Project exchanges, McKay Reservoir storage releases, and basin fish **passage** facilities are three equally important components of the fish passage equation. None of the three can optimize passage conditions without being used in conjunction with the other two. In addition, these efforts need to be coordinated with irrigation district activities which may also affect passage conditions.

Last year's annual report identified the need to update the passage facilities operational criteria developed by NMFS. Changes have been made to the criteria at a number of facilities without being formalized. Now that NMFS has additional engineering staff on board to deal with fish passage issues in the Umatilla Basin, maybe these criteria can be reviewed.

Objective 2 – Operation of Adult Trapping Facilities

Task 2.1 **– Threemile Dam Adult Trapping**

Both the Threemile Dam east bank ladder and adult facility performed satisfactorily during the 1996-97 season. The large number of high flow events again this year resulted in the facility being closed more often than in previous years. High flows and the resultant heavy debris and silt require a high level of maintenance to keep the adult facility pump system running. The collapse of the lead gate at Threemile Dam could have been prevented had an adequate amount of maintenance been done at the facility. Also, an **adequate level of maintenance of the pump bay screens would have** lessened the amount of down time during the year because of pumps **shutting down. We have requested that the perforated plate pump bay** screens be replaced with wedge wire material to help facilitate maintenance of the screens and minimize down time.

The fall start date for the Phase I exchange has been altered from mid-September to mid-August to more closely match the Umatilla River fall chinook migration timing in the mainstem Columbia River. The Phase I exchange was initiated August 14, 1996. Although no salmon or steelhead were captured until August 30, this is still earlier than would be expected without flow augmentation.

There were a number of minor mechanical breakdowns at the Threemile Dam east bank adult facility this year. Most were corrected in short order by UPFO&M personnel. The facility pumps appeared to lose capacity over the project season and need to be reconditioned annually.

The biggest problem at the facility was associated with the large debris and silt loads. Large amounts of debris and silt accumulated primarily in the dam forebay this year. Debris and silt in the forebay can restrict flow 'to the ladder and adult facility at lower flow levels and limit the ability to release fish directly into the river from the adult facility. The area around the release chute had to be dredged three times this year to deepen the release area and to remove silt bars which restrict upstream movement of fish after release. A major dredging of the Threemile Dam forebay may need to be done again to ensure that fish can migrate upstream without hindrance. Now that most adults are released into the forebay at Threemile Dam, rather than hauled upriver, this issue becomes one of much greater importance and needs more attention directed towards it.

Mud buildups in the holding pond prevent the crowder from resting on the floor of the pond. This allows adults to bury in the mud and get rolled under the crowder. Seven steelhead mortalities were attributed to this problem in February.

Less physical damage was noticed on adult spring chinook than in past years. Beginning in late May, a few spring chinook adults began showing up with symptoms of nitrogen supersaturation. A total of 35 fish were observed with "headburn" and two had gas bubbles. No unusual amount of damage was observed on the other species trapped at Threemile Dam.

There were 24 spring chinook trap mortalities at Threemile Dam. Four jumpout mortalities occurred when adults broke a cover panel off the steeppass. Four additional adults that jumped out in the same occurrance were recovered alive and returned to the pond. Of the remaining mortalities, approximately 75% were trap losses which occurred primarily in June when temperatures exceeded 65F.

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

Task 2.2 – Westland Adult Trapping

With the extended flow enhancement effort this year, **kelts had** an opportunity to volitionally migrate out of the system and none were captured at Westland this year.

Objective 3 – Operation of Juvenile Trapping Facilities

Task 3.1 – Westland Juvenile Facility Operations

There were few problems at the Westland juvenile collection facility. Canal forebay elevations were very stable this year. Frequent sensor maintenance and increased experience in operating the automated headgates system limited canal level fluctuations.

The barbs installed downstream of the Westland diversion **dam** prevented additional bank cutting and gravel deposition in the immediate vicinity of the Westland bypass outfall structure. Passage conditions at the bypass were much better this **year** than in the past. The bypass pipe **was** damaged during barb construction **and** had to be repaired before the bypass could be operated in the fall.

High flows experienced again this year continued **to deposit** gravel and aggrade the river channel below the diversion dam. This backs water up into the facility restricting bypass flows and hinders draining of the trapping facility for hauling operations.

A combination of high natural flows and flow augmentation allowed the facility to be operated in the bypass mode until **June** 26. This is the latest that flow enhancement measures have been used and permitted the majority of the juvenile outmigration to be bypassed at Westland. We anticipate that McKay Reservoir **storage** releases throughout June will be the standard operating procedure in the future for all but the driest years. This will allow Westland to be operated primarily in the bypass mode during the juvenile outmigration period and allow the majority of the **smolts to** migrate volitionally. Trap and haul operations will only be implemented to assist remnant portions of the outmigration, during drought conditions, or outside of the UBP target flow periods.

Poor water quality conditions were observed again this year at Westland. With low numbers of juveniles being trapped because of extended flow enhancement efforts, the physical and environmental constraints of the facility are not as significant as in the past during periods of large scale trapping.

Task 3.2 – 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 sufficient water during the

spring for juvenile outmigration below Threemile Dam and the west bank juvenile facility will be operated only in the bypass mode.

Normally the juvenile trap is operated for a few days after the bypass is closed at the west bank facility to ensure juveniles are not present. However, this year the pumpback pumps were inoperable and the facility was not run. No juveniles were observed in the bypass channel or outfall when the facility was shut down.

Objective 4 - Adult and Juvenile Transportation

Task 4.1 - Threemile Dam Adult Hauling

Project hauling equipment was generally adequate for adult transport needs in 1996-97. The small exit ports on the trailers still require the use of the 3,000 gallon tanker to haul adult chinook salmon.

High natural flows in combination with enhanced fall passage flows substantially reduced the number of fish transported upstream from Threemile Dam this year. Fish were released at Threemile Dam from September through May. Water available in McKay Reservoir for fish passage and adequate passage conditions at Feed Canal Dam allowed for release of adult spring chinook at Threemile Dam through the end of May. At this point spring chinook and steelhead adults were transported upstream based on project criteria which calls for 30 days of 150 cfs to be available for adult passage through the lower river. It was anticipated that flow augmentation efforts would be discontinued at the end of June.

Only spring chinook adults released at Threemile Dam were marked (caudal punch) to identify fallbacks. A total of 40 spring chinook fallbacks were recovered at Threemile Dam and were captured randomly throughout the season beginning April 30. This was less than 2% of the total run and it is questionable whether this low of number justifies the handling to mark them. Historical data indicates that fallback numbers are extremely low for the other three species and do not justify the additional handling required to mark them.

There were 11 spring chinook release mortalities observed at Threemile Dam, two at Thornhollow, and none at the South Fork brood facility. No other release mortalities were observed and condition of adults at release generally appeared good at all release sites.

The only usable upriver adult release site this year was Thornhollow. Release conditions at the site are marginal and need to be improved for the future. However, since most of the fish are now released at Threemile Dam the need for multiple developed release sites is not as critical as in the past. The Barnhart site still needs to be improved but it is anticipated that release sites located above Pendleton will be primarily used in the future.

Task 4.2 - Westland Kelt Hauling

No kelts were hauled from Westland this year.

Task 4.3 - Westland Juvenile Hauling

Due to the extended flow enhancement effort this year only small numbers of juveniles were trapped at Westland. The small number of fish trapped eliminate the need for a fish pump and all fish were loaded using dipnets. The Neilson fish pump was not borrowed from Lookinglass Hatchery this year. 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.

Hauling operations were evaluated by ODFW Fish Passage Research again this year. Results of the evaluation will be included in their annual report. High temperatures continue to be noted at the Umatilla River boat ramp juvenile release site. Temperatures of over 70F were recorded again this year.

Task 4.4 - Threemile Dam Juvenile Hauling

No juveniles were hauled from Threemile Dam this year.

Task 4.5 - Other Hauling Operations

Trap and Haul personnel and equipment were used this year to move fall chinook adults from Priest Rapids Hatchery to the Umatilla River. Of the mortalities observed at release, most were from the first load and due to a combination of shallow release conditions at the ODFW office site and a malfunctioning gate valve. The remainder of the loads released at Barnhart looked good upon release. Spawning commenced almost immediately after release and occurred primarily within a seven mile stretch just upstream from the release site. Considering the spawning condition of the fish, an estimated total loss of less than 10% was well within an acceptable range.

References

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Appendix A. 1996-97 Umatilla River Water Parameter Data

Date	3 MD TEMPS C	F	FLOW @ UMATILLA	FLOW @ PNDLTN	FLOW @ YOAKUM	SFC FLOWS	c s c FLOWS	WLC FLOWS	FLOW @ DILLON
01-Sep-96	19.6	67.3	78	41	226	49	0	139	3
02-Sep-96	19.1	66.4	78	41	225	49	0	140	3
03-Sep-96	18.9	66.0	81	41	226	48	0	139	3
04-Sep-96	19.2	66.6	81	42	229	49	0	141	4
05-Sep-96	18.2	64.8	76	43	238	49	0	154	4
06-Sep-96	17.4	63.3	80	43	230	49	0	139	4
07-Sep-96	17.9	64.2	85	43	229	47	0	144	5
08-Sep-96	18.9	66.0	82	42	222	44	0	146	4
09-Sep-96	19.5	67.1	78	42	215	52	0	137	4
10-Sep-96	19.4	66.9	79	42	120	38	0	64	4
11-Sep-96	19.2	66.6	79	42	121	52	0	37	5
12-Sep-96	19.2	66.6	86	42	113	51	0	37	5
13-Sep-96	18.7	65.7	81	47	106	46	0	42	10
14-Sep-96	18.2	64.8	106	50	99	41	0	43	4
15-Sep-96	18.2	64.8	107	57	107	39	0	32	5
16-Sep-96	17.3	63.1	103	57	97	28	0	26	20
17-Sep-96	16.7	62.1	116	55	95	27	0	39	17
18-Sep-96	16.5	61.7	111	54	84	22	0	51	1:
19-Sep-96	16.2	61.2	103	57	88	23	0	55	
20-Sep-96	16.1	61.0	92	63	88	23	0	54	
21-Sep-96	15.4	59.7	90	59	88	23	0	48	2
22-Sep-96	15.3	59.5	90	56	a4	23	0	45	2
23-Sep-96	14.6	58.3	90	56	141	23	0	39	2
24-Sep-96	14.1	57.4	122	57	242	29	0	36	123
25-Sep-96	13.7	56.7	234	56	245	34	0	44	136
26-Sep-96	13.9	57.0	235	55	245	28	0	50	144
27-Sep-96	14.7	58.5	243	55	244	28	0	50	149
28-Sep-96	15.8	60.4	237	52	237	29	0	51	142
29-Sep-96	16.8	62.2	223	51	223	25	0	51	134
30-Sep-96	16.9	62.4	221	50	220	23	0	49	134
01-Ott-96	16.4	61.5	212	50	215	27	0	34	125
02-Oct-96	15.3	59.5	234	51	221	26	0	22	154
03-Oct-96	15.1	59.2	240	52	238	25	0	21	162
04-Oct-96	15.5	59.9	244	52	239	26	0	26	159
05-Oct-96	16.3	61.3	234	54	238	26	0	33	148
06-Oct-96	16.0	60.8	246	56	227	25	0	32	148
07-Oct-96	15.9	60.6	251	55	226	25	0	37	153
08-Oct-96	16.1	61.0	244	53	223	25	0	39	152
09-Oct-96	16.2	61.2	240	53	205	12	0	40	151
10-Ott-96	16.2	61.2	250	52	205	1	0	44	154
11-Oct-96	16.0	60.8	240	53	205	0	0	49	147
12-Oct-96	15.6	60.1	238	53	204	0	0	'49	144
13-Oct-96	5.3	59.5	249	57	206	0	0	50	146
14-Oct-96	3.9	57.0	259	60	211	0	0	50	148
15-Oct-96	13.2	55.8	263	63	215	0	0	44	156
16-Oct-96	2.0	53.6	259	63	215	0	0	39	160
17-Oct-96	10.6	51.1	267	62	216	0	0	38	160
18-Oct-96	10.7	51.3	276	67	226	0	0	37	171
19-Oct-96	10.6	51.1	289	83	241	0	0	38	180
20-Oct-96	10.1	50.2	323	79	240	0	0	39	189
21-Ott-96	9.3	48.7	324	73	232	0	0	19	203
22-Oct-96	9.7	49.5	332	73	232	0	0	0	21i
23-Oct-96	9.9	49.8	325	87	240	0	0	0	221
24-Oct-96	10.8	51.4	343	100	263	0	0	0	242
25-Oct-96	10.9	51.6	346	123	282	0	0	0	26-
26-Oct-96	10.4	50.7	368	122	292	0	0	0	28'
27-Oct-96	9.7	49.5	366	107	276	0	0	0	26
28-Oct-96	9.7	49.5	353	102	267	0	0	0	25
29-Oct-96	10.5	50.9	365	104	281	0	0	0	26
30-Oct-96	10.6	51.1	359	102	274	0	0	0	26:
31-Ott-96	9.7	49.5	352	98	269	0	0	0	26:

ppendix A. (continued)

Date	3MDTEMPS C	3MDTEMPS F	FLOW@ UMATILLA	FLOW@ PNDLTN	FLOW@ YOAKUM	SFC FLOWS	csc FLOWS	WLC FLOWS	FLOW@ DILLON
01-Nov-96	8.7	47.7	347	90	268	0	0	0	250
02-Nov-96	8.2	46.8	343	91	265	0	0	0	246
03-Nov-96	8.1	46.6	340	89	262	0	0	0	240
04-Nov-96	8.6	47.5	334	90	261	0	0	0	239
05-Nov-96	8.6	47.5	335	92	261	0	0	0	237
06-Nov-96	8.5	47.3	334	92	258	0	0	0	230
07-Nov-96	8.4	47.1	328	99	264	0	0	0	230
08-Nov-96	8.8	47.8	305	104	144	0	0	0	152
09-Nov-96	8.9	48.0	214	103	124	0	0	0	103
IO-Nov-96	8.9	48.0	199	103	121	0	0	0	99
11 -Nov-96	8.8	47.8	190	103	118	0	0	0	96
12-Nov-96	8.5	47.3	192	100	117	0	0	0	91
13-Nov-96	8.9	48.0	192	103	115	0	0	0	92
14-Nov-96	9.4	48.9	190	107	115	0	0	0	92
15-Nov-96	9.1	48.4	191	113	118	0	0	0	96
16-Nov-96	8.7	47.7	196	117	122	0	0	0	100
17-Nov-96	8.8	47.8	200	123	125	0	0	0	104
18-Nov-96	8.8	47.8	224	165	159	0	0	0	133
19-Nov-96	7.4	45.3	335	637	381	0	0	0	261
20-Nov-96	6.1	43.0	945	1570	1380	0	59	0	97c
21-Nov-96	5.9	42.6	960	1050	952	0	127	0	614
22-Nov-96	5.4	41.7	670	755	712	0	157	0	438
23-Nov-96	5.4	41.7	NA	737	665	0	169	0	403
24-Nov-96	4.8	40.6	NA	646	619	0	166	0	39c
25-Nov-96	4.4	39.9	500	711	632	0	166	0	385
26-Nov-96	4.7	40.5	547	755	674	0	180	0	406
27-Nov-96	5.2	41.4	527	649	609	0	183	0	38;
28-Nov-96	6.0	42.8	493	986	731	0	188	0	4oc
29-Nov-96	6.4	43.5	773	1270	1010	0	183	0	559
30-Nov-96	6.4	43.5	810	1110	898	0	173	0	52(
01-Dee-96	6.8	44.2	695	1030	802	0	173	0	471l
02-Dec-96	5.7	42.3	672	984	777	0	180	0	46:
03-Dec-96	5.0	41.0	628	895	719	0	186	0	438
04-Dec-96	4.0	39.2	557	733	603	0	188	0	39'
05-Dec-96	4.3	39.7	569	1060	781	0	188	0	44:
06-Dec-96	5.2	41.4	661	894	722	0	188	0	44:
07-Dec-96	5.2	41.4	569	848	644	0	190	0	40:
08-Dec-96	6.3	43.3	675	1710	1100	0	197	0	61l
09-Dec-96	7.0	44.6	1448	2150	1780	0	195	0	132(
10-Dec-96	6.7	44.1	1911	2260	2200	0	195	0	162(
11-Dec-96	6.0	42.8	2651	2310	2420	0	187	0	201(
12-Dec-96	6.1	43.0	1940	1990	1700	0	186	0	1390
13-Dec-96	6.1	43.0	1408	1630	1350	0	183	0	1030
14-Dec-96	5.3	41.5	1218	1370	1180	0	189	0	862
15-Dec-96	4.8	40.6	1006	1070	962	0	187	0	635
16-Dec-96	5.0	41.0	808	915	849	0	183	66	509
17-Dec-96	3.8	38.8	772	748	752	0	184	77	472
18-Dec-96	2.4	36.3	717	611	655	0	149	60	449
19-Dec-96	2.2	36.0	647	524	578	0	106	60	437
20-Dec-96	3.0	37.4	566	513	534	0	154	60	398
21-Dec-96	3.9	39.0	506	511	527	0	185	59	380
22-Dec-96	4.2	39.6	477	482	497	0	189	59	36C
23-Dec-96	4.2	39.6	436	452	456	0	187	59	323
24-Dec-96	4.7	40.5	406	475	450	0	186	60	307
25-Dec-96	3.9	39.0	470	1280	946	0	190	60	53:
26-Dec-96	1.4	34.5	1269	1480	1280	0	87	60	97:
27-Dec-96	0.4	32.7	1241	1300	1150	0	29	53	899
28-Dec-96	0.9	33.6	1346	1250	1190	0	29	41	97:
29-Dec-96	0.2	32.4	1361	1360	1170	0	28	34	866
30-Dec-96	1.2	34.2	2849	3260	3430	0	10	25	268C
31-Dec-96	4.8	40.6	6212	5200	6120	0	0	0	6120

ppendix A. (continued)

Date	3MDTEMPS C	F	FLOW@ UMATILLA	FLOW@ PNDLTN	FLOW@ YOAKUM	SFC FLOWS	csc FLOWS	WLC FLOWS	FLOW@ DILLON
31-Jan-97	6.4	43.5	7212	7790	10700	0	0	0	9560
01-Jan-97	6.2	43.2	12407	5430	8300	0	0	0	9780
02-Jan-97	6.2	43.2	6983	3640	5450	0	0	0	5050
03-Jan-97	4.8	40.6	5061	2370	3990	0	0	0	3020
04-Jan-97	4.0	39.2	3550	1850	2900	0	0	0	2360
05-Jan-97	3.5	38.3	2373	1400	1850	0	0	0	1620
06-Jan-97	4.8	40.6	1781	1120	1490	0	18	42	1330
07-Jan-97	5.7	42.3	1457	960	1270	0	51	59	1120
08-Jan-97	5.7	42.3	1190	876	1110	0	120	56	902
09-Jan-97	6.6	43.9	1014	848	1020	0	169	55	723
IO-Jan-97	7.2	45.0	968	883	1060	0	183	55	718
11-Jan-97	4.5	40.1	1062	952	1160	0	186	55	849
12-Jan-97	1.7	35.1	1045	886	1050	0	83	46	870
13-Jan-97	0.6	33.1	1051	819	923	0	5	17	885
14-Jan-97	0.4	32.7	972	714	821	0	0	0	793
15-Jan-97	0.4	32.7	875	612	712	0	0	0	681
16-Jan-97	1.3	34.3	820	576	671	0	0	0	627
17-Jan-97	2.6	36.7	824	567	657	0	0	0	609
18-Jan-97	3.4	38.1	804	560	650	0	0	0	610
19-Jan-97	3.8	38.8	769	555	634	0	22	0	578
20-Jan-97	4.2	39.6	741	561	642	0	36	11	556
21-Jan-97	5.0	41.0	730	573	655	0	35	25	556
22-Jan-97	4.5	40.1	710	546	639	0	72	29	526
23-Jan-97	3.9	39.0	595	509	603	0	151	39	448
24-Jan-97	3.4	38.1	502	487	569	0	174	45	39i
25-Jan-97	2.6	36.7	503	475	559	0	121	48	418
26-Jan-97	1.3	34.3	545	421	493	0	72	41	434
27-Jan-97	1.6	34.9	555	411	495	0	38	36	454
28-Jan-97	1.9	35.4	595	419	491	0	0	36	470
29-Jan-97	2.8	37.0	613	920	892	0	0	36	52'1
30-Jan-97	3.7	38.7	3212	3410	4340	0	0	25	4130
31-Jan-97	4.5	40.1	9145	5050	7270	0	0	19	8320
01-Feb-97	5.1	41.2	6971	3130	5160	0	0	27	5610
02-Feb-97	4.4	39.9	4591	2300	3690	0	0	38	3410
03-Feb-97	3.9	39.0	3153	1820	2640	0	0	43	2380
04-Feb-97	3.4	38.1	2305	1440	1990	0	0	51	1750
05-Feb-97	3.2	37.8	1742	1140	1570	0	0	52	1390
06-Feb-97	2.6	36.7	1443	978	1320	0	0	54	1190
07-Feb-97	2.7	36.9	1215	897	1120	0	0	54	1020
08-Feb-97	3.0	37.4	1067	798	977	0	0	54	89'7
09-Feb-97	3.4	38.1	952	714	877	0	0	54	786
10-Feb-97		39.0	872	656	812	0	0	54	71 5
11-Feb-97		40.0	824	717	825	0	0	52	696
12-Feb-97		40.0	868	645	790	0	0	50	71 6
13-Feb-97		45.0	777	749	822	0	0	51	674
14-Feb-97		48.0	1161	1400	1420	0	0	51	1180
15-Feb-97		NA	1537	1580	1640	0	0	50	1430
16-Feb-97		45.0	1623	1730	1730	0	0	51	1550
17-Feb-97		48.0	1769	1780	1830	0	0	52	171 0
18-Feb-97		45.0	1724	1820	1840	0	0	52	176C
19-Feb-97		43.0	1995	1920	2010	0	0	52	2030
20-Feb-97		43.0	1798	1650	1750	0	0	52	1880
21-Feb-97		NA	1498	1330	1500	0	0	52	167C
22-Feb-97		41.0	1361	1090	1340	0	0	52	1540
23-Feb-97		42.0	1209	961	1180	0	0	52	1390
24-Feb-97		42.0	1087	898	1080	0	10	52	1270
25-Feb-97		46.0	949	859	941	0	91	52	1060
26-Feb-97		44.0	791	843	915	0	162	52	935
27-Feb-97		42.0	737	767	861	0	188	52	881
28-Feb-97									

AppendixA.(continued)

Date	3MDTEMPS C	F	FLOW@ UMATILLA	FLOW@ PNDLTN	FLOW@ YOAKUM	SFC FLOWS	csc FLOWS	WLC FLOWS	FLOW@ DILLON
Ol-Mar-97		NA	675	734	811	0	185	51	820
02-Mar-S7		42.0	766	1020	1070	0	192	52	1000
03–Mar–97		44.0	1039	1030	1170	0	192	52	1150
04–Mar–97		NA	931	923	1060	0	193	40	1060
05–Mar–97		43.0	875	841	957	0	191	24	984
06i-Mar-97		45.0	794	811	897	0	192	23	921
07'-Mar-97		48.0	817	986	1060	0	192	23	1010
08L-Mar-97		47.0	1279	1230	1610	0	197	24	1540
09b-Mar-97		NA	1430	1210	1590	0	197	24	1580
I-Mar-97		45.0	2487	3190	3830	0	182	44	3100
l-Mar-97		43.0	5285	3600	5130	0	137	54	5900
!-Mar-97		NA	5290	2990	4350	0	178	52	4820
s-Mar-97		NA	4654	2520	3580	0	189	50	3690
k-Mar-97		NA	3490	2330	2720	0	194	50	2780
j-Mar-97		NA	2574	2200	2300	0	190	50	2300
j-Mar-97		NA	2140	2140	1980	0	186	50	1950
T-Mar-97		49.0	2415	2590	3240	0	199	59	2620
3-Mar-97		NA	3977	2980	4110	0	192	66	3980
9–Mar–97		NA	4430	3630	4770	0	191	69	4870
I-Mar-97		NA	5114	4380	5660	0	187	69	6240
l-Mar-97		NA	5489	3990	5530	0	173	69	6660
Z-Mar-97		NA	5298	2910	4070	0	163	69	4750
3-Mar-97		NA	3946	2480	3160	0	156	69	3230
4–Mar–97		NA	2902	2290	2660	0	158	69	2630
5-Mar-97		48.0	2447	2170	2410	0	161	72	2330
6–Mar–97		49.0	2249	2200	2640	0	171	68	2370
7-Mar-97		49.0	2658	2420	3330	0	198	62	2910
8–Mar–97		47.0	2978	2170	2950	0	189	60	2750
g-Mar-97		NA	2523	1760	2280	0	176	61	2200
O-Mar-97		50.0	1953	1500	1900	0	163	45	1780
31-Mar-97		46.0	1698	1340	1700	0	119	3	1670
01–Apr–97		47.0	1481	1170	1500	0	99	1	1510
02–Apr–97		45.0	1304	1010	1340	2	97	1	1370
03–Apr–97		49.0	1113	955	1240	65	65	69	1160
04–Apr–97		49.0	1070	939	1240	66	1	94	888
05–Apr–97		NA	1039	879	1150	59	0	95	82;
06–Apr–97		47.0	943	828	1090	47	0	98	761
07–Apr–97		49.0	875	825	1060	52	0	121	701
08–Apr–97		50.0	823	833	1070	55	0	139	663
09–Apr–97		50.0	828	888	1140	60	0	154	685
10–Apr–97		50.0	859	924	1220	62	0	165	745
11–Apr–97		47.0	884	892	1210	62	0	166	760
12–Apr–97		NA	859	847	1150	63	0	169	70f
13–Apr–97		NA	817	863	1140	70	0	172	663
14–Apr–97		50.0	848	1040	1350	73	0	156	7713
15–Apr–97		50.0	1206	1800	2170	74	0	146	1320
16–Apr–97		54.0	1911	2120	2720	76	0	147	1810
17–Apr–97		52.0	2322	2160	2940	77	0	154	2131
18–Apr–97		51.0	2414	2130	2860	78	so	157	209
19–Apr–97		NA	2349	2380	3450	81	155	151	2230
20–Apr–97		52.0	3236	3310	4830	88	161	143	3560
21 -Apr-97		**NA**	**4815**	**3270**	**5000**	**88**	**150**	**139**	4761
22–Apr–97		NA	4397	2520	4000	85	130	143	34713
23-Apr-97		NA	3623	2830	4440	79	133	140	33313
24–Apr–97		NA	4701	2740	4690	81	134	126	4470
25–Apr–97		NA	4272	2340	3930	79	136	123	3420
26-Apr-97		52.0	3279	2070	3140	77	147	119	2600
27-Apr-97		NA	2828	2210	3480	78	144	122	2580
28–Apr–97		52.0	3033	2030	3070	81	141	128	2490
29–Apr–97		51.0	2488	1710	2510	77	136	123	191'0
30-Apr-97		53.0	2073	1620	2350	72	143	118	1 630

Appendix A. (continued)

Date	3MDTEMPS C	F	FLOW@ UMATILLA	FLOW@ PNDLTN	FLOW@ YOAKUM	SFC FLOWS	csc FLOWS	WLC FLOWS	FLOW@ DILLON
01-May-97		52.0	1917	1550	2310	75	148	123	1570
02!-Ma&97		51.0	1774	1330	2080	76	146	127	1420
03i-May-97		54.0	1538	1180	1800	82	146	131	1200
04I-May-97		54.0	1294	1180	1650	83	138	133	1020
05j-May-97		54.0	1232	1170	1710	87	130	142	1050
06j-May-97		57.0	1214	1220	1700	89	131	153	1010
07-May-97		57.0	1165	1160	1630	89	131	168	964
08s-May-97		55.0	1047	1090	1480	94	127	172	848
09a-May-97		58.0	937	1080	1440	100	137	172	762
10I-May-97		59.0	887	1110	1450	106	148	178	735
11-May-97		60.0	864	1150	1460	107	149	189	716
12-May-97		62.0	841	1110	1380	108	150	193	664
13-May-97		63.0	771	1110	1360	115	174	204	594
14-May-97		65.0	709	1080	1350	122	191	213	555
15j-May-97		65.0	634	1000	1240	125	198	219	506
16s-May-97		67.0	549	989	1180	136	192	230	482
17-May-97		68.0	504	956	1090	141	166	236	455
18-May-97		63.0	442	876	976	144	161	233	417
19g-May-97		62.0	352	745	800	140	155	222	333
20-May-97		60.0	224	668	705	140	120	230	226
21-May-97		60.0	219	593	631	126	7	217	287
22-May-97		60.0	245	533	570	99	0	208	261
23-May-97		61.0	237	498	529	86	0	211	219
24-May-97		61.0	291	466	509	82	0	207	225
25-May-97		62.0	301	440	482	75	0	196	215
26-May-97		61.0	306	428	500	69	0	198	232
27-May-97		62.0	320	411	478	69	0	197	216
28-May-97		65.0	277	387	466	64	0	190	20i
2'g-May-97		67.0	239	396	491	61	0	183	224
30-May-97		67.0	270	391	471	62	0	190	223
31-May-97		NA	291	386	452	63	0	164	218
01-Jun-97		NA	320	438	474	62	0	158	251
02-Jun-97		62.0	325	385	427	64	0	167	194
03-Jun-97		NA	274	345	401	63	0	169	148
04-Jun-97		65.0	278	398	517	53	0	143	29:3
05-Jun-97		NA	378	387	453	50	0	128	282
06-Jun-97		64.0	368	340	386	53	0	122	205
07-Jun-97		NA	306	312	366	58	0	124	162
08-Jun-97		NA	255	289	401	57	0	139	175
09-Jun-97		67.0	259	267	427	58	0	153	191
10-Jun-97		68.0	253	253	427	58	0	180	157
11-Jun-97		67.0	232	239	477	52	0	206	177
12-Jun-97		65.0	237	267	455	52	0	205	207
13-Jun-97		65.0	261	269	528	50	0	199	24:2
14-Jun-97		NA	285	238	486	48	0	192	206
15-Jun-97		69.0	275	215	457	48	0	196	194
16-Jun-97		70.0	265	198	436	60	0	194	165
17-Jun-97		71.0	245	191	454	65	0	201	156
18-Jun-97		NA	234	177	469	65	0	207	171
19-Jun-97		NA	236	162	453	63	0	204	174
20-Jun-97		64.0	236	155	455	63	0	210	165
21-Jun-97		NA	230	147	458	63	0	212	164
22-Jun-97		NA	235	146	465	63	0	212	174
23-Jun-97		65.0	241	136	542	72	0	207	217
24-Jun-97		64.0	267	131	607	77	0	201	31E
25-Jun-97		65.0	321	124	586	75	0	189	3 X
26-Jun-97		66.0	334	118	416	71	0	174	21:3
27-Jun-97	19.2	66.6	278	117	402	70	0	155	173
28-Jun-97	20.0	68.0	244	117	388	69	0	152	163
29-Jun-97	20.0	68.0	231	114	321	59	0	152	136
30-Jun-97	20.2	68.4	214	116	254	58	0	153	38

ppendix A. (continued)

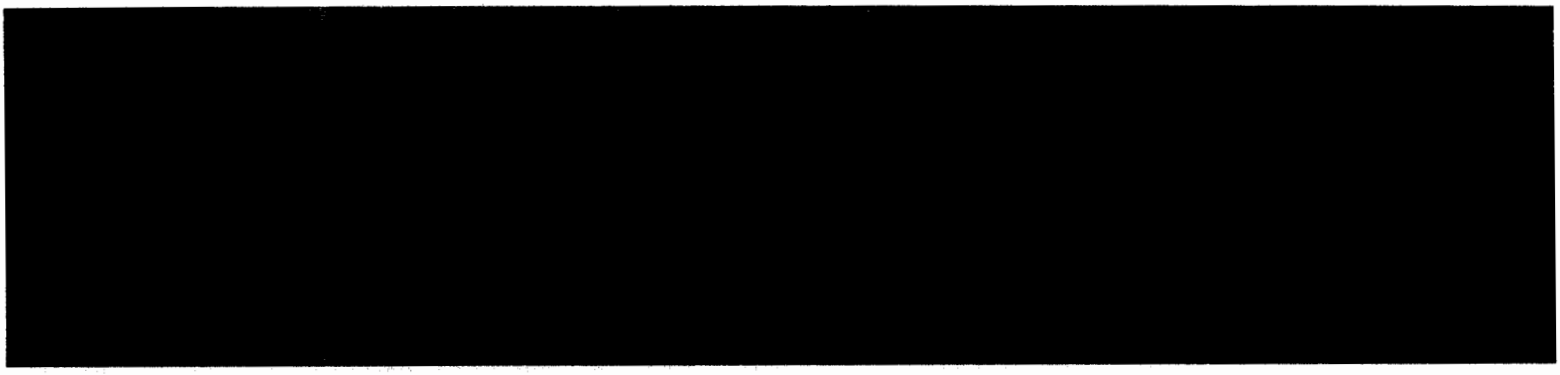
Date	3 MD TEMPS C	F	FLOW@ UMATILLA	FLOW@ PNDLTN	FLOW@ YOAKUM	SFC FLOWS	csc FLOWS	WLC FLOWS	FLOW @ DILLON
01–Jul–97	19.6	67.3	150	122	261	71	0	157	26
02–Jul–97	20.3	68.5	113	123	255	70	0	154	27
03–Jul–97	20.9	69.6	95	113	222	65	0	143	15
04–Jul–97	21.8	71.2	87	107	224	69	0	144	9
05–Jul–97	22.7	72.9	81	100	231	66	0	154	9
06–Jul–97	22.2	72.0	77	96	226	61	0	174	8
07–Jul–97	22.9	73.2	63	93	229	60	0	172	6
08–Jul–97	22.9	73.2	23	91	261	65	0	194	4
09–Jul–97	22.1	71.8	15	98	289	68	0	203	4
10–Jul–97	19.7	67.5	10	118	315	68	0	215	3
1 I-Jul-97	19.6	67.3	8	118	305	67	0	221	4
12–Jul–97	21.2	70.2	7	109	283	66	0	199	3
13–Jul–97	22.4	72.3	6	101	249	57	0	188	4
14–Jul–97	22.9	73.2	5	95	220	53	0	177	4
15-Jul-97	23.6	74.5	4	91	213	52	0	160	3
16–Jul–97	24.0	75.2	4	87	207	52	0	154	3
17–Jul–97	24.1	75.4	NA	86	223	52	0	135	3
18-Jul-97	24.3	75.7	NA	87	258	53	0	162	3
19–Jul–97	25.1	77.2	NA	85	258	52	0	177	4
20–Jul–97	24.8	76.6	NA	81	250	51	0	185	5
21–Jul–97	25.5	77.9	NA	78	242	51	0	162	5
22-Jul-97	24.1	75.4	NA	75	250	56	0	162	4
23-Jul-97	23.8	74.8	3	74	279	64	0	183	5
24-Jut-97	24.3	75.7	3	75	278	70	0	180	5
25-Jul-97	24.2	75.6	2	75	286	72	0	186	6
26-Jut-97	23.6	74.5	2	74	286	71	0	192	5
27-Jul-97	23.2	73.8	2	74	290	68	0	187	
28-Jul-97	23.5	74.3	2	73	277	67	0	175	
29-Jul-97	24.0	75.2	2	72	283	67	0	187	3
30–Jul–97	23.8	74.8	2	78	293	68	0	200	
31–Jul–97	23.7	74.7	2	84	270	58	0	195	16
01–Aug–97	24.2	75.6	2	80	240	49	0	191	3
02–Aug–97	25.0	77.0	3	72	225	50	0	175	3
03–Aug–97	26.5	79.7	3	67	238	48	0	158	3
04–Aug–97	26.9	80.4	3	64	245	47	0	166	3
05–Aug–97	26.4	79.5	3	63	246	48	0	164	3
06–Aug–97	26.9	80.4	3	59	249	58	0	148	2
07–Aug–97	26.2	79.2	3	55	257	60	0	157	2
08–Aug–97	24.8	76.6	3	55	253	60	0	156	2
09–Aug–97	23.5	74.3	2	56	252	59	0	157	2
10–Aug–97	22.8	73.0	2	54	250	60	0	160	2
11–Aug–97	23.7	74.7	2	53	261	59	0	179	1
12–Aug–97	23.8	74.8	2	50	283	55	0	197	1
13–Aug–97	24.2	75.6	2	49	273	55	0	188	1
14–Aug–97	24.2	75.6	2	48	257	55	0	178	3
15–Aug–97	22.4	72.3	4	45	259	53	0	175	2
16–Aug–97	22.6	72.7	34	46	262	54	0	171	2
17–Aug–97	22.0	71.6	46	47	265	55	0	184	2
18–Aug–97	22.1	71.8	52	46	281	55	0	198	2
19–Aug–97	22.0	71.6	55	45	290	52	0	206	2
20–Aug–97	21.6	70.9	58	45	282	65	0	191	2
21–Aug–97	20.5	68.9	60	48	277	65	0	176	1
22-Aug-97	21.0	69.8	62	47	276	66	0	175	1
23-Aug-97	21.6	70.9	63	45	275	67	0	174	1
24-Aug-97	21.7	71.1	64	47	263	69	0	178	1
25–Aug–97	20.8	69.4	69	48	242	62	0	186	1
26–Aug–97	19.8	67.6	83	48	212	40	0	183	2
27-Aug-97	20.3	68.5	85	45	203	43	0	172	2
28-Aug-97	20.2	68.4	84	45	191	42	0	158	2
29-Aug-97	20.2	68.4	83	44	192	43	0	156	2
30-Aug-97	20.7	69.3	80	44	185	43	0	140	2
31–Aug–97	20.8	69.4	77	44	185	43	0	125	2

Appendix B. 1996-97 Threemile Dam Adult Transportation Summary

Date	Loading Site Temperature	Release Site Temperature	Number Hauled	Release Site	Liberation Unit
8–30	NA	NA	1	Thornhollow	Trailer
9-06	67	59	1	Barnhart	Trailer
9-12	65	60	2	Barnhart	Trailer
9-16	64	60	3	Barnhart	Trailer
9-17	64	60	13	Barnhart	Trailer
9-18	64	60	9	Barnhart	Trailer
9-19	63	63	7	Barnhart	Trailer
9-20	64	64	2	Barnhart	Trailer
10-13	63	61	3	Minthorn	Trailer
10-21	48	52	1	Minthorn	Trailer
10–28	48	52	2	Minthorn	Trailer
11-04	51	60	3	Minthorn	Trailer
11-06	48	59	2	Minthorn	Trailer
11-26	49	48	49	Barnhart	Tanker
12-02	46	51	7	Minthorn	Trailer
12-09	52	54	4	Minthorn	Trailer
12-16	50	48	7	Minthorn	Trailer
l-10	51	48	11	Minthorn	Trailer
l-13	42	44	14	Minthorn	Trailer
1-22	49	48	2	Minthorn	Trailer
l-24	47	44	5	Minthorn	Trailer
2-13	40	42	5	Minthorn	Trailer
2-18	48	46	9	Minthorn	Trailer
2-24	42	45	4	Minthorn	Trailer
2-27	44	46	4	Minthorn	Trailer
3-10	45	46	5	Minthorn	Trailer
3-26	49	45	9	Minthorn	Trailer
3-31	46	45	3	Minthorn	Trailer
4-03	49	46	2	Minthorn	Trailer
4-07	49	46	3	Minthorn	Trailer
4-28	52	50	4	Minthorn	Trailer
5-01	52	48	1	Minthorn	Trailer
5-28	65	51	27	South Fork	Tanker
5-29	65	51	16	N.F. Meacham Ck.	Trailer
6-03	62	59	20	Thornhollow	Tanker
6-03	62	51	17	South Fork	Tanker
6-04	65	50	74	South Fork	Tanker
6-05	65	55	23	Thornhollow	Tanker
6-05	65	47	39	South Fork	Tanker
6-06	62	47	79	South Fork	Tanker
6-07	64	61	95	Thornhollow	Tanker
6-09	67	63	29	Thornhollow	Tanker
6-09	67	51	32	South Fork	Tanker
6-10	68	NA	27	Thornhollow	Tanker
6-11	67	62	13	Thornhollow	Tanker
6-12	65	54	9	Thornhollow	Tanker
6-13	65	57	31	Thornhollow	Tanker
6-15	69	66	31	Thornhollow	Tanker
6-16	70	67	8	Thornhollow	Tanker
6-16	70	51	12	South Fork	Tanker
6-17	68	65	4	Thornhollow	Tanker
6-20	64	60	16	Thornholiow	Tanker
6-23	65	65	34	Thornhollow	Tanker
6-24	62	64	16	Thornhollow	Tanker
6-25	65	65	14	Thornhollow	Tanker
6-26	66	64	9	Thornhollow	Tanker
6-27	65	66	7	Thornhollow	Tanker
6–30	68	NA	11	Thornhollow	Tanker
7-03	70	68	5	Thornhollow	Tanker
8-26	66	67	1	Thornhollow	Trailer

Appendix C. 1997 Westland Juvenile Transportation Summary

Date	Loading Site Temperature	Release Site Temperature	Pounds Hauled	Release Site	Liberation Unit
6-27	60	61	105	URBR	Trailer
6-29	61	63	280	URBR	Trailer
6-30	61	68	170	URBR	Trailer
7-03	63	70	350	URBR	Tanker
7-06	62	72	185	URBR	Trailer
7-07	65	70	139	URBR	Trailer
7-08	68	70	35	URBR	Trailer
7-10	58	62	92	URBR	Trailer
7-11	59	66	23	URBR	Trailer
7-14	69	68	58	URBR	Trailer
7-15	70	JO	23	URBR	Trailer
7-17	68	70	35	URBR	Trailer
7-18	67	70	24	URBR	Trailer
7-21	70	73	30	URBR	Trailer
7-24	64	69	35	URBR	Trailer
7-28	66	75	45	URBR	Trailer
7-30	62	70	46	URBR	Trailer



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