HATCHERY AND GENETIC MANAGEMENT PLAN (HGMP)

Hatchery Program:	Umatilla River Fall Chinook Program
Species or Hatchery Stock:	Fall Chinook, Umatilla River stock 091
Agency/Operator:	Oregon Department of Fish & Wildlife/ Confederated Tribes of the Umatilla Indian Reservation
Watershed and Region:	Umatilla/Columbia/Oregon
Draft Submitted: Re-submitted for ESA Consultation/Approval:	September 29, 2006 July 7, 2010; Approval Date: 04/20/2011
Date Last Updated: (*US v OR* PAC Proposal Endorsement)	February 2015

SECTION 1. GENERAL PROGRAM DESCRIPTION

1.1) Name of hatchery or program.

Umatilla River Fall Chinook Program.

1.2) Species and population (or stock) under propagation, and ESA status.

Fall Chinook (*Oncorhynchus tshawytscha*), the Umatilla fall Chinook stock is also known as Upriver Bright (stock 091); and is not an ESA-listed population.

1.3) Responsible organization and individuals.

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Other agencies, Tribes, co-operators, or organizations involved, including contractors, and extent of involvement in the program:
Confederated Tribes of the Umatilla Indian Reservation – Co-managers and operators of acclimation and adult collection facilities.

Bonneville Power Administration (BPA) – Provides funding for production of the 600,000 subyearling component from Umatilla Hatchery. The BPA also provides funding for acclimation, adult collection, passage, habitat, and monitoring and evaluation activities in the basin.

U.S. Army Corps of Engineers – Provides funding for production of the 900,000 yearling component of fall Chinook smolt production from Bonneville Hatchery under the John

Day Mitigation agreement.

1.4) Funding source, staffing level, and annual hatchery program operational costs.

The subyearling component of the program is produced at Umatilla Hatchery and is funded by the Bonneville Power Administration. Oregon Department of Fish & Wildlife operates the facility, and staff consists of one F&W Manager 1, one F&W Senior Technician, four and half F&W Technician, two Facility Maintenance Specialists, and six months of Administrative support. For the Fiscal Year 2008 Umatilla Hatchery operation budget was $966,664.

The yearling component of the program produced at Bonneville Hatchery is 100% funded by the U.S. Army Corps of Engineers. The Oregon Department of Fish & Wildlife operates the facility, and staff consists of one F&W Manager 2, one F&W Supervisor, one F&W Senior Technician, five F&W Technicians, one Facility Maintenance Specialist 1, and one Facility Operation Specialist 1.

1.5) Location(s) of hatchery and associated facilities.

Three Mile Falls Dam - Fall Chinook are collected at the Three Mile Falls Dam's east bank adult trapping facility. The facility is located approximately 4 miles upstream from the mouth of the Umatilla River, near the town of Umatilla, in Umatilla County, Oregon. The regional mark processing center site code for Three Mile Falls Dam is 5F33427 H27 24. If broodstock needs cannot be met at Three Mile Falls Dam, other locations where Upriver Bright stock is available, such as Bonneville Hatchery, may be used for broodstock collection or to supply eggs. Fall Chinook broodstock are held at an adult holding and spawning facility which is also located at Three Mile Falls Dam's east bank; and fish are spawned at this spawning facility.

Little White Salmon National Fish Hatchery (NFH) – During an interim period through BY18, and possibly in future year in low return years, Little White Salmon NFH will provide broodstock and eggs for the yearling component of the program. Operations at Little White Salmon NFH have already been consulted on and are covered under the 2007 Section 7 Biological Opinion for *USFWS Artificial Propagation Programs in the Lower Columbia and Middle Columbia River*. All facility and operational descriptions for the facility are included in the USFWS 2004 HGMP for *Little White Salmon/Willard NFH Complex Upriver Bright Fall Chinook Salmon* and are not included here.

Umatilla Hatchery – Fertilized eggs taken at Three Mile Falls Dam are transferred to Umatilla Hatchery for incubation and rearing. The facility is located along the Columbia River approximately two miles west of Irrigon in Morrow County, Oregon. The regional mark processing center site code for Umatilla Hatchery is 5F33449 H49 21.

Bonneville Hatchery - Eyed eggs from Umatilla Hatchery are transferred to Bonneville Hatchery for incubation and rearing. Green eggs from Little White Salmon National Fish Hatchery are also transferred to Bonneville Hatchery for incubation and rearing. The facility is located on Tanner Creek, near its confluence with the Columbia River in

Multnomah County, Oregon.

Pendleton Acclimation Facility – Yearling fall Chinook juveniles (720,000) shall be transferred from Bonneville Hatchery to the Pendleton Acclimation Facility for final rearing and release into the Umatilla River in March. The facility is located on the Umatilla River at RM 56 in Umatilla County, Oregon.

Direct Releases - Direct release of 120,000 yearling smolts (beginning in 2015) is planned to occur at the Pendleton Acclimation Facility in March but may occur in the future at Reith. The sub-yearling group of 600,000 juveniles are transferred from Umatilla Hatchery to Reith Bridge for direct release in May at RM 48.

1.6) Type of program.

The Umatilla River Fall Chinook program is mainly a harvest mitigation program, where 100% hatchery-origin fish shall be used as broodstock. Naturally-produced adult fall Chinook salmon shall not be used as broodstock in this program. Two groups of smolts will be produced under this program; one yearling group of 900K smolts and one sub-yearling group of 600K smolts, both focusing on meeting harvest objectives.

Program Background and Modification:

Sub-yearling smolt release program:
The Umatilla fall Chinook program has essentially remained the same since 2000 when the subyearling component of the program was reduced from a smolt release of 2.682M to 600K. The *US V Oregon* approved production Table B5 was updated to address changes to the program, particularly the marking rates, "Primary Purpose" designation, and all 600K sub-yearling juveniles for direct release at Reith without acclimation.

Yearling smolt release program:
The program had been releasing 480,000 yearling smolts from the Pendleton Acclimation Facility since 2011. The *US v Oregon* Production Advisory Committee (PAC) has agreed to an increase of 300,000 yearling smolts acclimated and released from the Pendleton Acclimation Facility, effective with brood year 2014; and 120,000 yearling smolts for direct release from Pendleton Acclimation Facility or Reith, effective with BY 2013. These release modifications meet the interim/long term goal of the Umatilla component of the new JDM for a total adult production (TAP) of 107,000 fall Chinook salmon annually.

1.7) Purpose (Goal) of program.

The purpose of the program is primarily to meet harvest mitigation goals with a secondary purpose of providing a supplementation benefit. The yearling component of the program has a more specific goal to meet the Umatilla component of the JDM program to produce 107,000 adult fall Chinook salmon annually.

1.8) Justification for the program.

The Umatilla River indigenous fall Chinook salmon were extirpated from the basin in the early1900's. The hatchery supplementation program has successfully reestablished a small fall Chinook salmon population within the basin and provides harvest benefits to commercial, recreational, and tribal fisheries The current fall Chinook program has been reprogrammed to focus on harvest mitigation, and the *US v Oregon* PAC has suggested further modifications to the program to offer more adult fish for harvests as part of the JDM. All broodstock for spawning shall consist of hatchery-origin fish, and all smolts shall have ad-clip and CWTs, for easy identification to determine their survival rates, adult harvest locations, stray rates, effects of release strategies, etc. The ODFW's Fish Health Management Policy and IHOT standards for fish health shall be followed to maintain fish health and to prevent transmission of disease agents to the watershed. The performance of program fish shall be evaluated through monitoring activities.

1.9) List of program "Performance Standards".

See Section 1.10.

1.10) List of program "Performance Indicators", designated by "benefits" and "risks".

1.10.1) "Performance Indicators" addressing benefits.

	Benefits	
Performance Standard	**Performance Indicator**	**Monitoring and Evaluation**
Program meets legally mandated rebuilding objectives.	Release 600,000 smolts of 0-age and 900,000 smolts of age 1+ yr into the Umatilla River.	Monitor releases to insure numbers fall within IHOT guidelines of ± 10% of stated goal.
Program meets legally mandated harvest objectives.	Program provides adults for mainstem treaty and non-treaty harvest.	Assess contribution to mainstem fisheries.
Program provides predictable, stable, and increased harvest opportunity.	Within tributary treaty and non-treaty harvest seasons occur annually.	Frequency of treaty and non-treaty tributary fisheries will be determined.
Restore and create viable natural spawning populations.	Natural adult return and escapement objectives to Three Mile Falls Dam are met.	Monitor adult returns at Three Mile Falls Dam to assess contribution of naturally produced adults. Monitor spawning escapement, redds, and juvenile production numbers.
Program is self sufficient utilizing in-basin broodstock.	Enough eggs are collected annually from broodstock collected at Three Mile Falls Dam to meet program release goals.	Broodstock holding and survival data and spawning data including fecundity and viability are monitored to ensure that production goals are met.
Release groups are sufficiently marked in order to assess contribution to rebuilding and fisheries goals.	All hatchery fish released are differentially marked either externally (e.g. adipose fin removal) or internally (e.g. coded- wire tag).	Adults enumerated at Three Mile Falls Dam, collected for broodstock, harvested, or recovered as carcasses are checked for fin-clip marks and coded-wire tags to determine survival rates and run composition.
Achieve within-hatchery performance measures.	IHOT standards are being met.	Rearing and fish health parameters are monitored to ensure that fish culture standards are being attained.
Conduct hatchery and natural production RM&E to improve program performance.	Develop comprehensive subbasin RM&E plan.	Determine if RM&E tasks outlined in the plan are being implemented and associated objectives are being addressed.
Communicate and coordinate effectively with co-managers in the Columbia River basin.	Participate in US v Oregon production advisory committee (PAC) meetings.	Provide technical information for PAC reports.

1.10.2) "Performance Indicators" addressing risks.

	Risks	
Performance Standard	**Performance Indicator**	**Monitoring and Evaluation**
Minimize impacts to ESA listed and other native species from enumeration and broodstock collection activities.	Level of trapping and handling mortality of summer steelhead (STS) at Three Mile Falls Dam.	Trap and recovery tank mortalities will be enumerated.
Minimize impacts to ESA listed and other native species from disease transmission.	Program will be in compliance with IHOT fish health transfer guidelines.	ODFW pathology will examine the fish at least once per month and just prior to fish transfer.
Minimize impacts to ESA listed and other native species from juvenile hatchery releases.	Smolts will be acclimated and released according to regionally accepted Best Management Practices (BMP).	Outmigration timing and survival will be monitored at Three Mile Falls Dam.
Minimize impacts to ESA listed and other native species from program adults straying.	Number of program adults straying to and captured in other river subbasins.	Coded wire and PIT tag recoveries of program adults are accessed through the PSMFC data bases and summarized.
Minimize impacts to ESA listed and other native species from program related harvest activities.	Number or percent of natural STS taken or caught and released in treaty and non-treaty tributary fisheries.	Fisheries harvest surveys are conducted by the state and Tribal agencies to ensure take limitations for STS are not being exceeded.

1.11) Expected size of program.

The current Umatilla River fall Chinook production goal is to produce 1.5 million juveniles annually. The total smolts production is divided in two groups. The yearling group consists of 900,000 smolts, which are produced at Bonneville Hatchery and the sub-yearling group consisting of 600,000 smolts produced at Umatilla Hatchery. See below Table 1.11.2 for proposed release numbers and locations.

1.11.1) Proposed annual broodstock collection level (maximum number of adult fish).

In the interim, approximately 450 adults at a 1:1 sex ratio are required in order to produce the 600,000 subyearling smolt program. Bonneville Hatchery will need to receive ~1.2M green eggs from Little White Salmon NFH for the 900,000 yearling smolt program. In the long term, when brood for both programs are collected at Threemile Dam, an estimated 1,150 adults at a 1:1 sex ratio will be needed to produce 600,000 subyearlings and 900,000 yearlings. The entire broodstock population shall consist of hatchery-origin fish and there are no plans to incorporate jacks into the brood.

1.11.2) Proposed annual fish release levels (maximum number) by life stage and location.

Life Stage	Release Location	Annual Release Level
Eyed Eggs	McKay Creek	75,000[a]
Unfed Fry		0
Fry		0
Fingerling (sub-yearling)	Umatilla River @ RM 48 (Reith)	600,000
Yearling Smolts	Pendleton AF (RM 56) Pendleton - Direct Release	780,000 120,000

[a] Placeholder for outlets of surplus production

1.12) Current program performance, including estimated smolt-to-adult survival rates, adult production levels, and escapement levels. Indicate the source of these data.

- Smolt-to-adult Survival: Subbasin Plan goals are 0.75% for the yearling program and 0.3% for the subyearling program. Smolt-to-adult survival from brood years 1981-2007 ranged from <0.1-3.1% and averaged 1.43% for the yearling program, and from <0.01-1.10% with a mean of 0.19% for the sub-yearling program. (Appendix Tables 1 and 2, Clarke et al. 2014). Total number of adults produced for the yearling and subyearling programs combined has ranged from 121–34,393 and averaged 7,685.

- Adult Return: Umatilla Basin Summary goal is 4,000 hatchery adult returns. From 1995-2012, hatchery adult returns to the Umatilla River mouth ranged from 289 to 3,950 and averaged 1,547 (Appendix Table 3, Clarke et al. 2014).

- Non-endemic hatchery fall Chinook enumerated TMFD from run years 1993 to 2012 comprised an average of 1.92% of hatchery returns and 1.79% of combined hatchery and natural returns (Appendix Figure 1, Clarke et al. 2014). The most prevalent non-endemics originated from hatchery smolt releases in the lower Snake River. Most (72%) of the non-Umatilla origin fish were jacks.

- Adult Escapement to Natural Production Areas: Since run year 1996, hatchery adults passed upstream at TMFD for spawning has ranged from 39 to 3,178 and averaged 949 (Appendix Table 4, Umatilla Hatchery M&E Project database). Outplants from Priest Rapids Hatchery supplemented spawning escapement by an average of 706 adults per year from 1996 to 2004.
- Harvest in the Umatilla Basin: Since 2000, non-tribal harvest has average 103 jacks and adults with a high of 390 in 2012 and a low of 33 in 2007; (Appendix Table 6; note additional CWT reporting may increase harvest estimates).

- Harvest out-of-Basin: Since 2000, ocean harvest has averaged 2,075 fish with a high

of 4,376 in 2003 and low of 449 in 2012. Columbia River non-tribal harvest (sport and commercial) has averaged 475 fish. Columbia River tribal harvest has averaged 975 fish with a high of 1,944 fish in 2010 and a low of 503 fish in 2000 (Appendix Table 5; note additional CWT reporting may increase harvest estimates).

1.13) Date program started (years in operation), or is expected to start.

The first release of fall Chinook in the Umatilla River took place in 1982 using Tule stock, since that time only upriver bright fall Chinook stock has been released. The release data of Umatilla fall Chinook program from 1992-2008 are shown in Table 16.

1.14) Expected duration of program.

This is an on-going program and shall continue indefinitely.

1.15) Watersheds targeted by program.

Umatilla River Basin.

1.16) Indicate alternative actions considered for attaining program goals, and reasons why those actions are not being proposed.

To achieve the program goals, the co-managers have reassessed this fall Chinook hatchery program and modified actions as per suggestions and recommendations made by the PAC of the *US v Oregon*.

SECTION 2. PROGRAM EFFECTS ON ESA-LISTED SALMONID POPULATIONS.

2.1) List all ESA permits or authorizations in hand for the hatchery program.

The HGMP for this program was approved by NMFS on 04/20/2011 through the ESA consultation process. Additional modification to this program has been made as per recommendations made by the PAC, which has been reflected in this updated version of the HGMP. In addition, the ODFW's evaluation of juvenile steelhead outmigration and survival in the lower Umatilla River basin is conducted under NOAA Fisheries' 4d rule research permit # 13765.

2.2) Provide descriptions, status, and projected take actions and levels for ESA-listed natural populations in the target area.

2.2.1) Description of ESA-listed salmonid population(s) affected by the program.

- Identify the ESA-listed population(s) that will be directly affected by the program.

None.

- Identify the ESA-listed population(s) that may be incidentally affected by the program.

Umatilla fall Chinook program may incidentally affect the Snake River fall Chinook population via strays. Monitoring results suggest that sub-yearling program produces higher stray rates than the yearling program. The sub-yearling program was reduced to 600,000 in brood year 2000. From run years 2000–2009 the total number of Umatilla origin adults plus jacks that strayed to out-of-basin locations has been estimated at 10,314, with an annual average of 1,031 fish. (Appendix Tables 1 and 2).

Stray rates within the subyearling program are typically > 35% per run year (Table 1). Most stray adults from both subyearling and yearling releases are recovered in the Snake River basin. Results from an acclimated v direct stream release study suggest no difference in survival or stray rates between release strategies (Clarke et al. 2014). Stray rates within the yearling program average about 13% per run year. Early results from an ongoing study with the yearling program suggests a hatchery rearing protocol may identified that will better synchronize smoltification to the timing of acclimation, thereby reducing stray rates.

A portion of Umatilla stray adults from yearling and subyearling releases are collected and removed through the Lyons Ferry brood stock collection efforts at Lower Granite Dam. Although difficult to estimate, it is believed that since return year 2000 an average of no more than 2% of the hatchery origin adults returning to Lower Granite Dam on the Snake River are from Umatilla River releases (Figure 1; Young et al. 2013).

Table 1. Mean number and percent of Umatilla River hatchery fall Chinook salmon returns reaching the mouth of the Umatilla River that strayed upriver into the Snake and Upper-Columbia River (Up. Col. R.) Basins. Time series correspond with prior to and after Phase I+II flow enhancement became fully operational in 1995, and downsizing of Umatilla subyearling smolt production (2005-2012). Data units were annual returns. Data to update this table beyond run year 2012 is not yet available.

Time Period	No. strays Snake R.	No. strays Up. Col. R.	No. strays total	% strays Snake R.	% strays Up. Col. R.	% strays total
			SUBYEARLING RETURNS			
Run years 1985 – 1994	314	862	1,176	22.4	63.7	86.1
Run years 1995 – 2004	298	270	568	25.7	23.8	49.5
Run years 2005 – 2012	196	70	266	25.0	13.0	38.0
			YEARLING RETURNS			
Run years 1985 – 1994	46	25	71	43.2	15.7	58.9
Run years 1995 – 2004	288	106	394	16.0	10.0	26.0
Run years 2005 – 2012	385	84	469	10.4	2.6	13.0

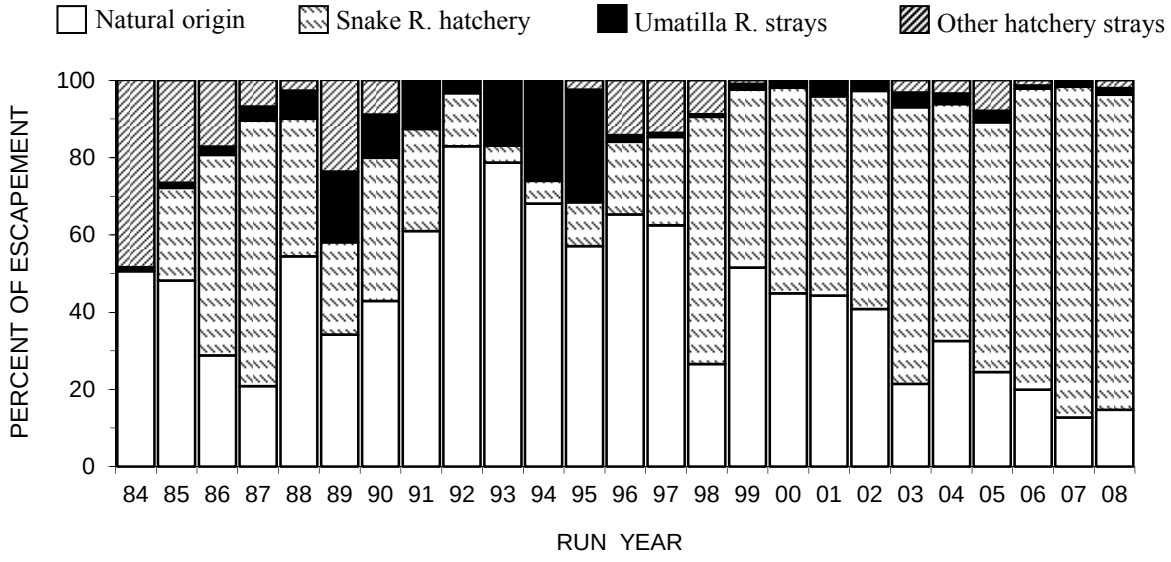


Figure 1. Percent composition of fall Chinook salmon escapement past Lower Granite Dam, run years 1984-2008. Data do not include subjacks. Data from WDFW Lyons Ferry Hatchery M&E annual reports and databases.

Umatilla River Summer Steelhead (*Oncorhynchus mykiss*; stock 091) – included as part of the Mid-Columbia ESU - listed as "Threatened" under the federal ESA, which may be incidentally affected by the program. The past returns of wild- and hatchery-origin summer steelhead to Three Mile Falls Dam are shown in Table 2.

Table 2. Summer steelhead adult returns to Three Mile Falls Dam and percentage of natural- and hatchery-origin fish, 1987-2013[1].

Year	# Hatchery Fish	# Wild Fish	Total	% Hatchery Fish	% Wild Fish
1987-88	165	2,315	2,480	7	93
1988-89	370	2,104	2,474	15	85
1989-90	245	1,422	1,667	15	85
1990-91	387	724	1,111	35	65
1991-92	523	2,246	2,769	19	81
1992-93	616	1,297	1,913	32	68
1993-94	345	945	1,290	27	73
1994-95	657	874	1,531	43	57
1995-96	785	1,296	2,081	38	62
1996-97	1,463	1,014	2,477	59	41
1997-98	903	862	1,765	51	49
1998-99	750	1,135	1,885	40	60
1999-00	752	2,140	2,892	26	74
2000-01	1,091	2,571	3,662	30	70
2001-02	1,895	3,621	5,516	34	66
2002-03	963	2,117	3,080	31	69
2003-04	1,287	2,101	3,388	38	62
2004-05	756	1,722	2,478	31	69
2005-06	488	1,480	1,968	25	75
2006-07	914	2,566	3,480	26	74
2007-08	901	2,232	3,133	29	71
2008-09	715	2,515	3,230	22	78
2009-10	1,075	3,895	4,970	22	78
2010-11	804	4,031	4,835	17	83
2011-12	898	3,297	4,195	21	79
2012-13	661	2,507	3,168	21	79
Average	**785**	**2,040**	**2,825**	**29**	**71**

[1]Source: Clarke et al. 2014

To estimate the duration of naturally-produced steelhead in freshwater and salt water, scale samples were taken and processed in order to determine the years spent in the two different environments. Based on scale analysis, over 87.5% of natural adult summer steelhead returning to TMD spent two years in freshwater before outmigration (Figure 2). Nearly equal numbers of age 4 (46%) and age 5 (48%) adult steelhead returned in all years combined. There is considerable variability from year to year as shown by the 2007 data (Figure 3).

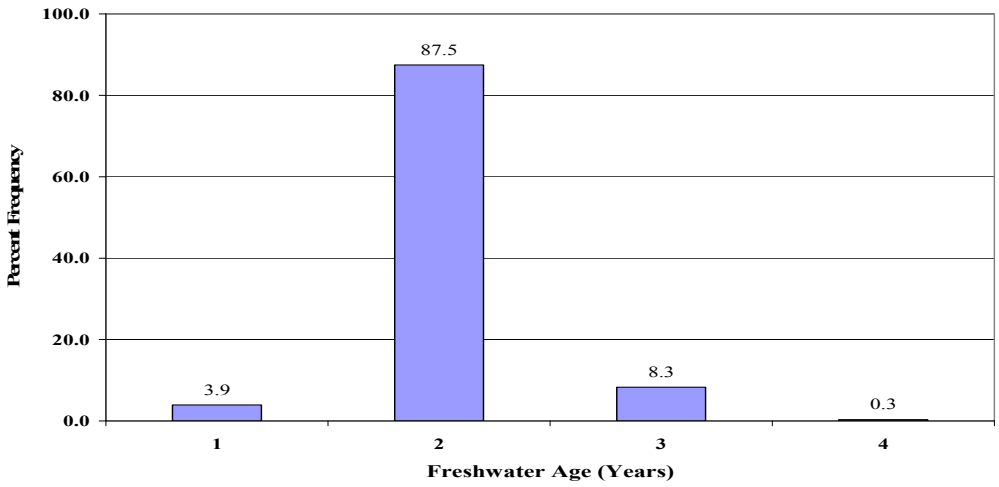


Figure 2. Years of Freshwater Rearing of Natural Summer Steelhead Adults Returning to the Umatilla River, 1983, 1989, 1990, 1992, and 1994-2004, 2006, 2007 (n = 918).

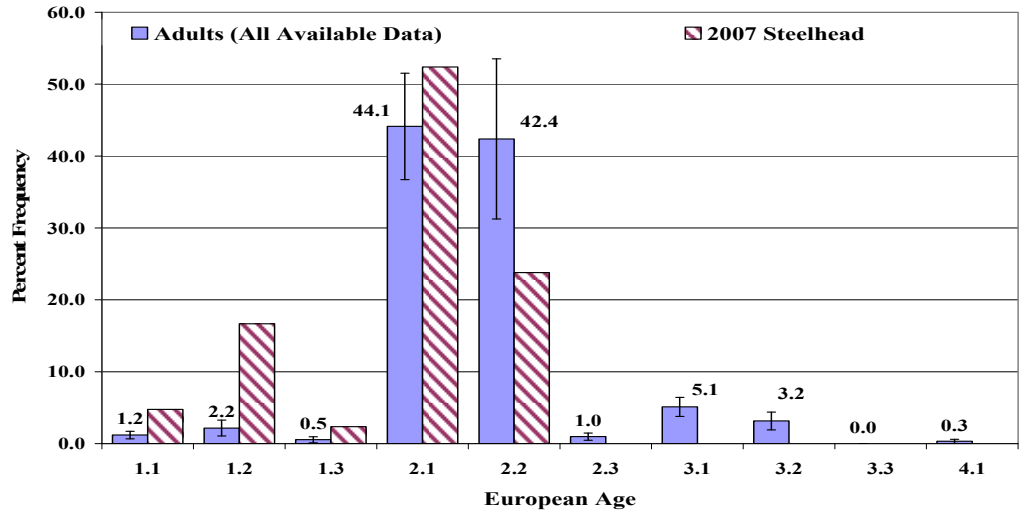


Figure 3. Combined European Age (years of freshwater and salt water rearing) of Natural Summer Steelhead Adults Returning to the Umatilla River (solid bars1983, 1989, 1990, 1992, and 1994-2004, 2006, 2007 return years, n = 918 with plus and minus one standard deviation; banded bars, 2007 data only; n = 42).

Tables 3a-3c. Life History Tables of Umatilla summer Steelhead by River Reach.

2a. From the mouth of the Umatilla to the mouth of McKay Creek (RM 0 – 50.5).

Life History Stage	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.
Adult Migration	x	x	x	x	x	x	x	x				
Prespawning Holding												
Spawning												
Incubation												
Rearing	x	x	x	x	x	x	x	x	x	x	x	x
Juvenile Migration	x	x	x	x	x	x	x	x	x	x		

3b. From the mouth of McKay Creek to the mouth of Meacham Creek (RM 50.5 - 79.0) and mid-basin streams.

Life History Stage	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.
Adult Migration	x	x	x	x	x	x	x	x				
Prespawning Holding					x	x	x	x				
Spawning						x	x	x				
Incubation						x	x	x	x			
Rearing	x	x	x	x	x	x	x	x	x	x	x	x
Juvenile Migration	x	x	x	x	x	x	x	x	x			

3c. From the mouth of Meacham Creek to the forks (RM 79 - 89 and headwater streams).

Life History Stage	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.
Adult Migration	x	x	x	x	x	x	x	x				
Prespawning Holding					x	x	x	x				
Spawning						x	x	x				
Incubation						x	x	x	x			
Rearing	x	x	x	x	x	x	x	x	x	x	x	x
Juvenile Migration	x	x	x	x	x	x	x	x	x			

2.2.2) Status of ESA-listed salmonid population(s) affected by the program.

- Describe the status of the listed natural population(s) relative to "critical" and "viable" population thresholds.

Abundance and productivity population viability thresholds (5% extinction probability over 100 years) defined by the Mid-Columbia Steelhead ESA Recovery Plan are a 10-year geometric mean of 1,500 natural origin spawner and a SAR adjusted and delimited return/spawner productivity of 1.26 (NMFS 2008). Current viability measures reported for the Umatilla population by NMFS (2008) were 1,472 natural spawners and 1.50 return/spawner productivity.

- Provide the most recent 12 year (e.g. 1988-present) progeny-to-parent ratios, survival data by life-stage, or other measures of productivity for the listed population. Indicate the source of these data.

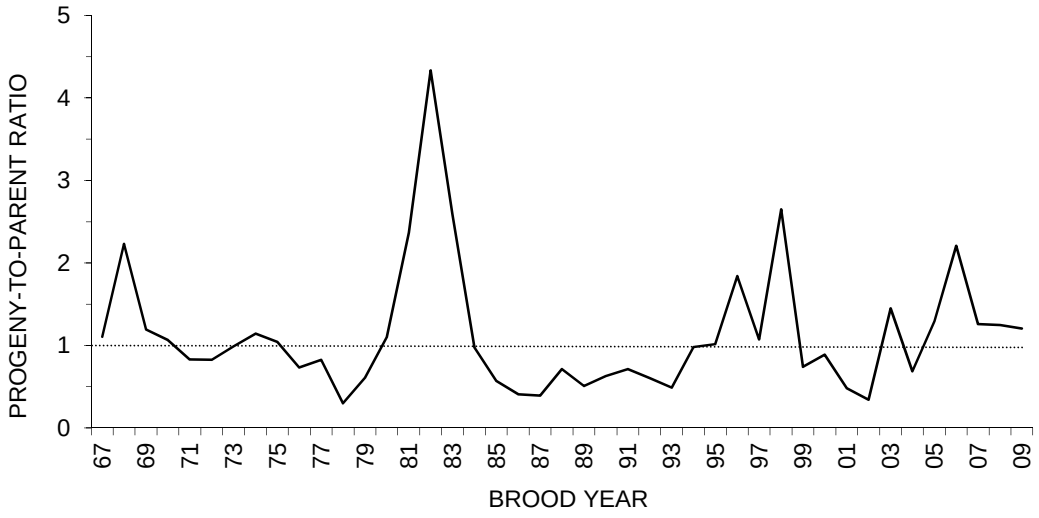


Figure 4. Progeny-to-parent ratio productivity measure for Umatilla River naturally-reared steelhead (Umatilla Hatchery M&E Project database). Parents were hatchery and natural spawning escapement; progeny were estimates of natural adults produced.

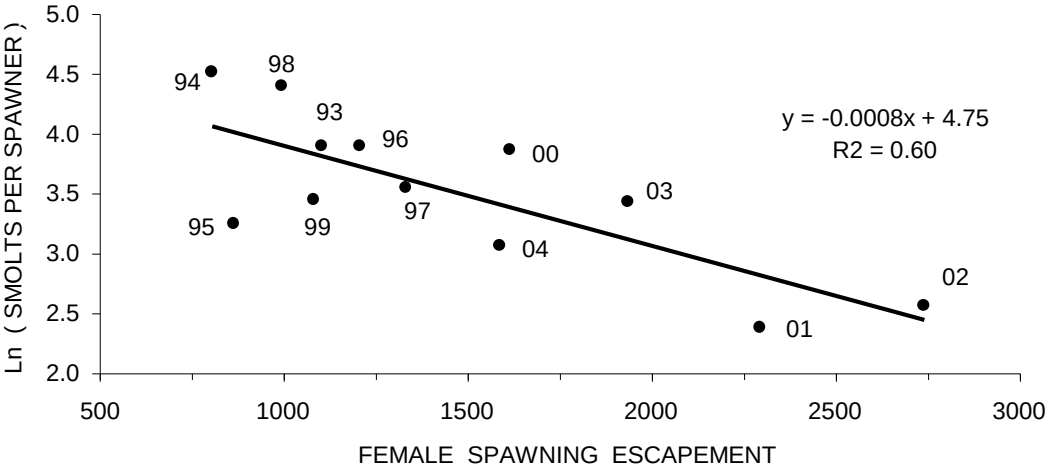


Figure 5. Smolts per female spawner productivity measure for Umatilla River naturally-reared steelhead. Smolts were estimated abundance of juvenile out-migrants to the lower Umatilla River (Josh to provide reference & updated graph). All available egg-to-smolt survival and smolt-to-adult return data for Umatilla natural steelhead are presented below in Table 4.

Table 4. Egg-to-smolt survival and smolt-to-adult return (SAR) for Umatilla naturally-produced steelhead. Data are incomplete for number of smolts produced by the 2003 and 2004 broods, and number of adult returns from the 2001 and 2002 broods.

EGG-TO-SMOLT SURVIVAL				SMOLT-TO-ADULT RETURN			
Brood Year	No. Eggs	No. Smolts	Survival (%)	Outmigration Year	No. Smolts	No. Returns	SAR (%)
1993	6,116,187	52,010	0.85	1995	54,361	837	1.54
1994	4,323,435	68,162	1.58	1996	73,361	1,040	1.42
1995	4,824,913	26,295	0.54	1997	22,221	1,025	4.61
1996	5,761,557	59,278	1.03	1998	59,182	3,151	5.32
1997	6,969,537	46,532	0.67	1999	46,530	2,295	4.93
1998	5,267,468	83,144	1.58	2000	81,759	4,015	4.91
1999	5,809,681	32,573	0.56	2001	33,844	1,131	3.34
2000	7,278,281	73,177	1.01	2002	77,016	2,268	2.94
2001	12,631,251	26,813	0.21				
2002	13,813,433	37,559	0.27				
2003	11,815,091	56,855	0.48				
2004	7,214,651	31,423	0.44				
93-04 Mean	**7,279,574**	**50,554**	**0.83**	**95-02 Mean**	**56,034**	**1,970**	**3.63**

- Provide the most recent 12 year (e.g. 1988-1999) annual spawning abundance estimates, or any other abundance information. Indicate the source of these data.

The number of wild and hatchery origin adult steelhead in the natural spawning ground are presented in Table 5 and the percentage of hatchery origin adults in Table 6.

Table 5. Disposition of summer steelhead (STS) adults returning to the Umatilla River at and above Three Mile Falls Dam 1996-2008. Run year 2007-08 data are preliminary.

RUN YEAR	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	**2007**
	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	**2008**
Total Steelhead	2081	2477	1765	1885	2892	3662	5516	3080	3388	2478	1968	3480	3133
Natural STS	1296	1014	862	1135	2140	2571	3621	2117	2101	1722	1480	2566	2232
Hatchery STS	785	1463	903	750	752	1091	1895	963	1287	756	488	914	901
Natural STS Sacrificed or Mort	7F-1M	5F	1F-1M	1F	0	2F	1F	1F	2F	2F 2M	1F	0	1F
Hatchery STS Sacrificed or Mort	58F-15M	51F-44M	43F-27M	51F-23M	29F-13M	69F 28M	26F 23M	54F 28M	35F-27M	23F 20M	26F 14M	22F 24M	34F 49M
Natural STS Taken for Brood[a]	52F-50M	50F-50M	40F-40M	47F-49M	44F-57M	46F 46M	47F-47M	49F 51M	38F-41M	42F 39M	35F 42M	40F 40M	43F-42M
Hatchery STS Taken for Brood	14F-17M	10M	11F-19M	15M	15M	10M	10M	9M	10F-9M	10F 9M	10F 10M	10F 10M	5F 5M
Natural Females Available to Spawn	863	689	549	720	1317	1753	1944	1472	1063	1029	646	1521	1496
Hatchery Females	342	641	450	370	308	547	800	465	540	377	122	383	377

RUN YEAR	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	**2007**
	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	**2008**
Available to Spawn													
Total Females Available to Spawn	1205	1330	999	1090	1625	2300	2744	1937	1603	1406	768	1904	1873
Natural Males Available to Spawn	323	220	226	313	722	724	1571	538	951	605	750	964	644
Hatchery Males Available to Spawn	275	660	308	205	284	350	861	346	574	249	159	347	308
Total Males Available to Spawn	598	880	534	518	1006	1074	2432	884	1525	854	909	1311	952
Natural STS Available to Spawn	1186	909	775	1033	2039	2477	3515	2010	2014	1634	1396	2485	2140
Hatchery STS Available to Spawn	617	1301	758	575	592	897	1661	811	1114	626	281	730	685
Total STS Available to Spawn	1803	2210	1533	1608	2631	3374	5176	2821	3128	2260	1677	3215	2825
Redds Observed in Index Reaches	119	138	126	218	238	382	347	322	208	218	50	190	
Index Reaches Miles Surveyed	21.4	21.4	21.4	21.4	21.4	21.4	19.4	21.4	19.9	21.4	17	19.5	
Total Redds Per Mile in Index Reaches	5.6	6.4	5.9	10.2	11.1	17.9	17.9	15.0	10.5	10.2	3.1	9.7	

[a] *Does not include excess brood released back to the river at the end of spawning operations.*

- Provide the most recent 12 year (e.g. 1988-1999) estimates of annual proportions of direct hatchery-origin and listed natural-origin fish on natural spawning grounds, if known.

From brood years 1996-2008, the percent of hatchery origin adults available to spawn has ranged from 16.8-58.9 and averaged 31.9% (Table 6).

Table 6. Percent of adults available for spawning in the Umatilla River that were hatchery origin, brood years 2001-2013.

Brood Year _	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Percent of Spawners Hatchery Origin	26.6	32.1	28.7	35.6	27.7	16.8	22.7	25.0	19.6	19.5	14.2	19.7	18.3

2.2.3) Describe hatchery activities, including associated monitoring and evaluation and research programs, that may lead to the take of listed fish in the target area, and provide estimated annual levels of take

- Describe hatchery activities that may lead to the take of listed salmonid populations in the target area, including how, where, and when the takes may occur, the risk potential for their occurrence, and the likely effects of the take.

The Three Mile Falls Dam adult collection facility is operated on a daily basis from August 16 until December 1st. During this time period, the facility is operated to collect fall Chinook and summer steelhead broodstock and to enumerate and record biological data on all returning salmonids including coho. All adults collected are anesthetized with CO_2. Fish not collected for broodstock are transferred to recovery tanks prior to release back into the Umatilla River.

Beginning December 1st, the trapping facility is generally operated for five days and is then closed for nine days. Returning adults are allowed to volitionally migrate upstream when the trap is not being operated and adult returns are video enumerated. During this time period, the trap is operated to collect summer steelhead and spring Chinook broodstock and to collect biological data. Trapping and transportation of all salmonids is implemented in the spring when passage flow criteria of 150 cfs for 30 days after release cannot be met. The trap is generally not operated from July 15 to August 16.

Operation of the adult collection and enumeration facility as described above may also lead to the incidental take of listed fish during handling activities. In addition, the current goal is to collect 100 unmarked steelhead as broodstock in order to provide the eggs for the steelhead propagation program, which has been described in a separate HGMP.

A complete list of activities for the ODFW Umatilla Hatchery Monitoring and Evaluation project (#1990-005-00), the ODFW Evaluation of Juvenile Salmonid Outmigration and Survival in the Lower Umatilla River Basin project (#1989-024-01), the CTUIR's Umatilla Basin Natural Production Monitoring and Evaluation project (#1990-005-01), and the CTUIR's Development of Progeny Marker for Salmonids to Evaluate Supplementation project (#2002-030-00) are provided in their respective Statements of Work to the Bonneville Power Administration.

Excerpt from the 2010 Annual Operation Plan summarizing M&E activities for Umatilla steelhead, Chinook and coho salmon.

A. Steelhead

1. Umatilla Hatchery, 2009 brood- Determine and compare rearing performance, smolt condition, juvenile migration performance, and smolt-to-adult survival of steelhead released from the Minthorn and Pendleton facilities, and those direct stream released near Bonifer site. Lengths (300), weights (100), smolt conditions, and descaling (100) will be sampled from fish at transfer to and release from acclimation facilities. Thornhollow may be used in low river flow emergencies. To determine juvenile migration performance to TMFD, John Day and Bonneville Dams approximately 1,500 fish per raceway will be PIT tagged. To determine smolt-to-adult survival we will ADLV+CWT mark 20,000 fish from each of the three release groups. All remaining fish will be marked AD.

B. Spring Chinook salmon

1. Umatilla Hatchery, 2008 brood yearlings- Determine and compare rearing performance, smolt condition, juvenile migration performance, and smolt-to-adult survival of each of the three yearling spring Chinook salmon release groups (standard transfer released in March, fall transfer released in March, and fall transfer released in December). Lengths (300), weights (100), smolt conditions, and descaling (100) will be sampled from fish at transfer to and release from acclimation facilities. To determine migration performance we will PIT-tag 4,600 fish from one Michigan series for each of the two fall transfer release groups (3 raceways) in October 2009 and transfer them to Imeques acclimation facilities. An additional group of 2,300 fish will be PIT-tagged in one Michigan series (3-raceways) of the standard release group in January 2009.

2. Umatilla Hatchery, 2009 brood yearlings- To determine migration performance we will PIT-tag 2,300 fish in each of the 2 Harvest Group releases, and 1,500 fish in the Conservation Group release. Smolt-to-adult survival of the *Conservation Group* will be determined by coded-wire-tagging and all released fish will be without fin clips. For the *Harvest Group*, we will mark 40,000 fish (ADCWT) in release groups that are transferred to Imeques in fall and winter. All remaining *Harvest Group* production will be AD clipped.

C. Fall Chinook salmon

1. Umatilla Hatchery, 2009 brood sub-yearlings- Determine rearing performance, smolt condition, juvenile migration performance, and smolt-to-adult survival of fall Chinook salmon reared at Umatilla Hatchery and released into the Umatilla River. Lengths (300), weights (100), smolt conditions, and descaling (100) will be sampled from fish at transfer to and release from acclimation raceways. To determine juvenile migration performance we will PIT tag 800 fish in May 2010.

2. Bonneville Hatchery, 2008 brood yearlings- Determine and compare smolt condition, and smolt-to-adult survival of yearling fall Chinook salmon release at Thornhollow and Pendleton. Lengths (300), weights (100), smolt conditions, and

descaling (100) will be sampled from fish at transfer to and release from acclimation raceways. To determine and compare smolt-to-adult survival release groups, 25,000 fish from each of the two release groups will be marked ADCWT. All remaining fish will be marked Ad clipped.

D. All broods-Determine and compare smolt-to-adult survival, fishery contribution, straying, relative smolt-to-survival, adult production, Umatilla River return, and life history characteristics of all rearing and release strategies from groups at Umatilla and Bonneville hatcheries.

NATURAL PRODUCTION EVALUATION (CTUIR)

A. Monitor natural spawning activities of hatchery and natural adult spring Chinook, fall Chinook and coho salmon, and summer steelhead in the Umatilla River Basin.
B. Estimate tribal harvest of adult salmon and steelhead returning to the Umatilla River Basin.
C. Determine age, growth of spring Chinook salmon and summer steelhead in the Umatilla River Basin.
D. Salvage stranded salmon or steelhead as needed.
E. Adult Passage Evaluations: Determine fallback ratios and passage routes, rates, and delays at diversions. Determine holding and spawning locations:
   Summer steelhead (tag 60 adults)
   Fall Chinook (tag 15 adults)
   Coho (tag 15 adults)
   Collaborate with the Lamprey Project
   Install and monitor 5 fixed site receivers on major diversions
F. Juvenile Outmigration Monitoring: Collaborate with ODFW M&E project to estimate wild STS smolt production, survival, and timing.
   Operate Meacham Creek smolt trap and PIT tag wild salmonids
   Collaborate at Three Mile Falls Dam with the Lamprey Project and ODFW M&E
   Collaborate at diversion dams with Bureau of Reclamation M&E Project
   Install new PIT tag detectors at Three Mile Falls Dam, WEID bypass channel, Adult Ladder.

Bureau of Reclamation Monitoring and Evaluation Program
Summer Steelhead – 2009 Brood

The Columbia Cascades Area Office for the Bureau of Reclamation (BOR) has requested 4,500 ad clipped Umatilla Hatchery summer steelhead smolts (HSTS) to assess *take* in BOR operated Feed and Maxwell irrigation canals. This first component will assess *take* from production releases of steelhead as they migrate through the Umatilla River. This component requires approximately 4,500 smolts, 1,500 for each release site; BOR will provide PIT tags (model #TX1411SGL or alternative) and Bonneville Power Administration (BPA) will provide funding for ODFW staff (through their ongoing M&E project) to insert PIT tags and release marked fish. ODFW M&E staff will insert 4,500

fish with PIT tags between January and March 2010 to assess the production releases. These fish will be utilized for the out migrations study as well as *take* assessment. Fish and Wildlife Service, Abernathy Laboratory, will provide technical expertise and monitoring of the detection systems at Feed and Maxwell Canals and TMFD. Additional systems may be installed later, if needed. Pending results will determine the number of PIT tagged fish for ongoing studies.
BOR will also contract with CTUIR to survey and salvage stranded fish within the Feed and Maxwell canals after the irrigation season when facilities are shutdown.

JUVENILE OUTMIGRATION M&E

A. Operate and maintain smolt trap and PIT tag detection system at Three Mile Falls Dam.
B. PIT tag up to 3,000 natural summer steelhead smolts.
C. Estimate the abundance and survival of natural summer steelhead smolts.
D. Monitor the life history characteristics of natural summer steelhead smolts.
E. Collaborate with the Hatchery M&E and Natural Production M&E projects to estimate the productivity of natural summer steelhead.
F. Collaborate with the Natural Production M&E project on the design and installation of new PIT tag antennas at Three Mile Falls Dam.

CTUIR's Activities to Develop Progeny Marker for Salmonids: Following a habitat inventory a back pack electro shocking survey will be conducted for capturing and sampling juvenile steelhead. A multiple removal method will be used for calculating population estimates of juvenile steelhead in Iskuulpa Creek and for taking a lethal sample from about 200 juveniles. Juveniles will be anesthetized using MS-222. Juveniles taken for otoliths will be euthanized with an overdose of MS-222. After the first year of introducing the strontium marker we will focus our otolith sampling to the zero age fish only. After the second year we will focus our otolith sampling to zero and yearling age juveniles. After the third and succeeding years we collect samples from all age classes. CTUIR also monitors freshwater mussels and lamprey.

- Provide information regarding past takes associated with the hatchery program, (if known) including numbers taken, and observed injury or mortality levels for listed fish.

Since 2001, mortality at Three Mile Falls Dam of natural steelhead adults has ranged from 0.00% to 0.23% of the total annual natural STS return (0-4 fish) with an average of 0.074%. Past mortality and broodstock collection data are included in Table 5. The numbers of juveniles sampled and sampling mortalities (1995-2007) at Three Mile Falls Dam are shown in Table 7, but these activities were directly related to Umatilla River summer steelhead propagation and M&E programs which have been described in a separate HGMP.

Table 7. Annual number of juvenile summer steelhead sampled, and sampling mortalities, in the Umatilla River from 1995 to 2007.

Year	Number of fish Sampled		Sampling Mortalities	
	Hatchery	Natural	Hatchery	Natural
1995[a]	10,652	1,869	21	7
1996	12,432	3,451	50	14
1997	162	194	4	7
1998	1,924	2,642	50	61
1999	1,882	1,816	28	27
2000	1,078	626	0	1
2001	4,980	847	50	15
2002	1,029	630	14	6
2003	1,172	1,015	7	35
2004	1,071	660	3	6
2005	2,197	1,992	103	10
2006	1,720	1,020	9	18
2007	763	693	12	7

[a] Includes fish sampled using a fyke net at river mile 0.5 and fish captured at Feed, Maxwell and Westland Canal traps.

- Provide projected annual take levels for listed fish by life stage (juvenile and adult) quantified (to the extent feasible) by the type of take resulting from the hatchery program (e.g. capture, handling, tagging, injury, or lethal take).

Table 8. Estimated listed salmonid take levels by hatchery activity.

Listed species affected: Mid-Columbia steelhead ESU/Population: Mid-Columbia steelhead Activity: Operation of Three Mile Falls Dam				
Location of hatchery activity: Three Mile Falls Dam (TMFD)Dates of activity: Operated every month of the year Hatchery program operator: Confederated Tribes of the Umatilla Indian Reservation (CTUIR) and Oregon Department of Fish and Wildlife. TMFD operated by CTUIR				
Type of Take	**Annual Take of Listed Fish By Life Stage *(Number of Fish)***			
	Egg/Fry	Juvenile/Smolt	Adult	Carcass
Observe or harass a)	0	0	1,200*	0
Collect for transport b)	0	0	0	0
Capture, handle, and release c)	0	0	1,200*	0
Capture, handle, tag/mark/tissue sample, & release d)	0	10,000**	0	0
Removal (e.g. broodstock) e)	0	0	0	0
Intentional lethal take f)	0	0	0	0
Unintentional lethal take g)	0	0	0	0
Other Take (specify) h)	0	0	0	0

a. Contact with listed fish through stream surveys, carcass and mark recovery projects, or migrational delay at weirs.
b. Take associated with weir or trapping operations where listed fish are captured and transported for release.
c. Take associated with weir or trapping operations where listed fish are captured, handled and released upstream or downstream.
d. Take occurring due to tagging and/or bio sampling of fish collected through trapping operations prior to upstream or downstream release, or through carcass recovery programs.
e. Listed fish removed from the wild and collected for use as broodstock.
f. Intentional mortality of listed fish, usually as a result of spawning as broodstock.
g. Unintentional mortality of listed fish, including loss of fish during transport or holding prior to spawning or prior to release into the wild, or, for integrated programs, moralities during incubation and rearing.
h. Other takes not identified above as a category.

Notes: * During fall Chinook salmon adult trapping at TMFD, potentially 1,200 listed steelhead may be encountered, handled, released, or used for the steelhead broodstock (6 pairs) production.

** M&E on salmonid juvenile emigration is an ongoing project that includes other programs as well, which may handle thousands of listed steelhead, as well as, thousands of non listed Chinook and Coho in April, May, and June.

- Indicate contingency plans for addressing situations where take levels within a given year have exceeded, or are projected to exceed, take levels described in this plan for the program.

Outmigration and Survival Study - As per 4d rule research permit # 13765, we will reduce numbers collected by adjusting the sampling times and avoid sampling when large numbers of natural steelhead are passing through the sampling facility. To reduce the number of mortalities from fish jumping out of the sample tank or from other areas, we will apply covers and screens to prevent escapement and monitor the facility closely. Monitoring information is mostly obtained through remote interrogation of tags, without any handling. No contingency actions are planned for the adult handling or broodstock collection.

SECTION 3. RELATIONSHIP OF PROGRAM TO OTHER MANAGEMENT OBJECTIVES

3.1) Describe alignment of the hatchery program with any ESU-wide hatchery plan (e.g. *Hood Canal Summer Chum Conservation Initiative*) or other regionally accepted policies (e.g. the NPPC *Annual Production Review* Report and Recommendations - NPPC document 99-15). Explain any proposed deviations from the plan or policies.

The program is included in Table B.5 of the *US v. Oregon* 2008-2017 Management Agreement of the Columbia River Fish Management Plan. The program is also consistent with the NPCC Umatilla/Willow Subbasin Plan and follows the 1995 Integrated Hatchery Operations Team (IHOT) Policy and Procedures for Columbia Basin Anadromous Salmonid Hatcheries.

3.2) List all existing cooperative agreements, memoranda of understanding, memoranda of agreement, or other management plans or court orders under which program operates.

1. CTUIR. 1994. Wildlife Mitigation Plan (Draft) May 1996, Columbia Basin Salmon Policy. 1995 pages 9-10, and Water Assessment Report;
2. NMFS - Salmon & Steelhead Enhancement Plan for the Washington and Columbia River Conservation areas.Vol 1. chapter 4, 37pages;
3. Reeve, R. 1988. Umatilla River Drainage Anadromous Fish Habitat Improvement Plan;
4. CTUIR/ODFW. 1990. Umatilla Hatchery Master Plan;
5. OWRD. 1988. Umatilla Basin Report;
6. BOR. 1988. Umatilla basin Project Planning Report;
7. Umatilla County - Comprehensive Plan. 1983, chapter 8;
8. USNF - Umatilla National Forest Land & Resource Management Plan. 1990, chapter 2, page 13. and Final EIS. 1990, chapter III, pages 59-62;
9. CTUIR/ODFW. 1990. Umatilla River Subbasin Salmon and Steelhead Production Plan;
10. Boyce, R. 1986. A Comprehensive Plan for Rehabilitation of Anadromous Fish Stocks in the Umatilla River Basin;
11. USFWS & NMFS. 1982. Umatilla R. Planning Aid Report; and
12. USBR and BPA. 1989. Umatilla Basin Project. Initial project workplan presented to the NWPPC, May 1989.
13. US v Oregon, 2008-2017 Management Agreement
14. Mid-C Steelhead Recovery Plan

This HGMP is consistent with these plans and commitments.

3.3) Relationship to harvest objectives.

State and tribal co-managers as part of the Umatilla Hatchery Master Plan developed fall Chinook harvest guidelines. These guidelines were designed to support the rebuilding of

the fall Chinook run. The fall Chinook fishery in the lower Umatilla has been limited to a jack only bag limit, due to low adult returns. Discussions are occurring in regards to opening the tributary fishery for adults in response to increased adults returns over the past five years. In addition, changes to the harvest guidelines will be implemented once returns from the "stepping stone" production program are realized. The fall Chinook program also contributes to ocean and Columbia River fisheries.

3.3.1) Describe fisheries benefiting from the program, and indicate harvest levels and rates for program-origin fish for the last twelve years (1988-99), if available.

The fall Chinook program primarily contributes to ocean and Columbia River fisheries (Appendix Table 5). From 1985-2007, most out-of-basin harvest was in the ocean (56%) and Columbia River tribal fisheries (30%), with the remaining 14% in Columbia River non-tribal fisheries. Total numbers harvested per year ranged from 588-19,677 and averaged 4,753.

Harvest in the Umatilla River non-tribal fishery has been restricted to jacks and subjacks to conserve typically low adult returns for hatchery brood and in-river spawning. We report adult harvest from an approximately 200 m reach of the Umatilla River downstream of Highway 730 that is considered part of the Columbia River per Oregon angling regulations. Since 1992, annual harvest has averaged 12 adults, 29 jacks, and 129 subjacks; or 1.1%, 5.5%, and 9.3% of their respective return size. Tribal participation in the Umatilla River fall Chinook salmon fishery has been minimal since the early 1900's.

3.4) Relationship to habitat protection and recovery strategies.

The Umatilla Fall Chinook Program is a part of the overall Umatilla Basin Salmon and Steelhead restoration efforts. In addition to on-going hatchery operations, fish passage and habitat restoration efforts are being implemented along with monitoring and evaluation of both the hatchery and natural components of the restoration program. Factors limiting the natural production of fall Chinook in the Umatilla River Basin include channelization, low summer flows, warm water temperatures, sediment, and poor habitat diversity caused by urban and rural development/land management practices. Ocean conditions and the mortalities and stress from the operation of hydropower projects on the mainstem Columbia River are important factors outside the basin. There continues to be degradation to fish habitat in these areas that hampers improvement efforts.

Umatilla program is carefully monitored to evaluate strays into Snake River population. All yearling production is acclimated to the Umatilla River prior to release. The subyearling production is either acclimated or released at Reith Bridge.

3.5) Ecological interactions.

(1) Interactions with species that could negatively impact program: The program may be negatively impacted by a variety of freshwater and marine predators during migration

periods such as northern pikeminnow, smallmouth bass, seagulls, cormorants, Caspian terns, and pinnipeds which could significantly reduce overall survival rates of program fish.

(2) Interactions with species that could be negatively impacted by program: Co-occurring natural steelhead populations in the Umatilla River and ESA listed salmon and steelhead populations in the mainstem Columbia River could be negatively impacted by co-mingling with program fish in migration corridors. Impacts could potentially occur from competition for food, predation, disease transmission, or density dependent effects. In addition, program adults have been documented as straying into the Snake River. In order to minimize the potential for these effects to occur, program fish are released as smolts in the mid to upper basin. The program also follows the protocols outlined by IHOT (1995) to minimize the potential for disease transmission to occur.

(3) Interactions with species that could positively impact program: Other salmonid species that naturally spawn in the target stream may positively impact program fish by contributing nutrients from decaying carcasses that increase productivity of the Umatilla River.

(4) Interactions with species that could be positively impacted by program: The program provides a benefit to other salmonid species in the basin by contributing nutrients from decaying carcasses that increase productivity of the Umatilla River. Fall Chinook also play an important role in community ecology since this population historically existed sympatrically with other species in the basin.

SECTION 4. WATER SOURCE

4.1) Provide a quantitative and narrative description of the water source (spring, well, surface), water quality profile, and natural limitations to production attributable to the water source.

Umatilla Hatchery - The water for the Umatilla Hatchery comes from the Columbia River through a Ranney well system, and four separate wells. The system was initially designed and constructed to produce a maximum of 15,000 gpm of water. However, actual water capacity at UH is 5,500 gpm, and several wells have been subject to failure (Jack Hurst, ODFW, Umatilla Hatchery). Water temperature from the well system averages 12.2°C (54°F). Water quality exceeds BPA requirements (BPA 1987) for all hatchery uses. Water is withdrawn under certificate #72181, permit G 10870, and, certificate #72182, permit #G 11210. Discharged hatchery effluents are monitored under the NPDES general permit 300 J.

Bonneville Hatchery – The primary water source for Bonneville Hatchery is Tanner Creek. The facility has water rights for 50 CFS of water from Tanner Creek. Rainfall and snow pack highly affect water temperatures and available flow to the hatchery. Water quality is typically high with temperatures ranging from 32 to 55^{o}F. August typically has recorded the highest temperatures and January the lowest. During high water adult salmon and steelhead can pass above the Tanner Creek intake to spawn. These fish have been known to carry IHN and have infected programs at Bonneville Hatchery.

Tanner Creek is subjected to very cold weather which can result in intake problems from anchor ice and slush build up and potential loss of flow. The Bonneville Hatchery intake on Tanner Creek is currently not in compliance with NOAA Fisheries screening criteria, but Oregon Department of Fish and wildlife's Fish Passage and Screening section is currently reviewing the work necessary to bring it into compliance.

A secondary source of water for Bonneville hatchery is a well field located on Robbins Island within the confines of the Bonneville Dam/Corps of Engineers Project. Originally seven wells operated to produce 18,000 gpm. In recent years, the well field has become depleted and now only produces approximately 15,000 gpm. Bonneville Hatchery operates under the NPDES general permit # 300J.

Three Mile Falls Dam - The water for both the Three Mile Falls Dam's east bank trapping and adult holding and spawning facilities is pumped directly from the Umatilla River. Water temperatures range from approximately 0°C (32°F) in winter to over 21°C (70°F) during the summer. Sediment loads vary dramatically during the year and large sediment loads are experienced annually during high flow conditions.

At the trapping facility, the Denil steeppass utilizes 2,900 gpm and the holding pond uses 1,450 gpm. Both the steeppass and holding pond pumps run continuously. The fish lock system uses 630 gpm, but is used only during handling operations (approximately two hours per day). The adult holding and spawning facility operates from late September through

early December. It can utilize up to 8,000 gpm for the holding ponds but typically uses less than half of that amount. An additional 900 gpm can be used for the fish lock system during spawning operations which occur once or twice a week in November and early December.

Pendleton Acclimation Facility - Water for the facility is pumped directly from the Umatilla River. Water flow is approximately 1,600 gpm per pond. During the juvenile acclimation period (February - mid March), daily temperatures fluctuates from 1.5 to 10^{o}C (34.7 to 50^{o}F). High sediment loads are experienced in some years during high flow conditions.

4.2) Indicate risk aversion measures that will be applied to minimize the likelihood for the take of listed natural fish as a result of hatchery water withdrawal, screening, or effluent discharge.

Umatilla Hatchery-- Umatilla Hatchery uses 100% well water, and operates under the NPDES general permit # 300 J.

Bonneville Hatchery --Intake at this time is not NOAA Fisheries screen criteria compliant, but Oregon Department of Fish and wildlife's Fish Passage and Screening section is currently reviewing the work necessary to bring it into compliance. Bonneville Hatchery operates under the NPDES general permit # 300 J.

Pendleton Acclimation Facility - Facility intake screens conform to NMFS screening guidelines to minimize the risk of entrainment of juvenile listed fish.

SECTION 5. FACILITIES

5.1) Broodstock collection facilities (or methods).

Broodstock collection is conducted solely at the Three Mile Falls Dam's east bank adult trapping facility. The facility consists of a vertical slot fish ladder, Denil steeppass, adult holding pond (raceway), and fish handling and sorting complex.

The dimensions of the holding pond are 14' wide by 36' long by 3.5' deep (approximately 1,800 cubic feet). The holding pond has a jump screen located at the upper end and jump-out panels located at both upper corners to prevent adults from jumping out of the pond. In addition, the pond is equipped with a spray bar system to discourage jumping. The holding pond is located above the historical 100 year flood level.

The water supply for the holding pond is pumped directly from the Umatilla River at a rate of 1,450 gpm. A low water discharge alarm is located on the pond supply line to signal any loss of flow to the holding pond. No emergency generator system is located at the site. However, the pumps for the fall Chinook broodstock facility at Three Mile Falls Dam are tied into the holding facility and can be used to supply water in case of mechanical failure of the trapping facility pumps. The adult holding facility pumps are backed up by an emergency generator. Two other emergency procedure options are available to on-site personnel. During power outages or other short term losses of flow, the outlet gate from the pond can be closed to maintain water depth. For long term losses of water supply, adults can be dip-netted out of the pond and returned to the river.

Adults are crowded into the fish lock and raised up to the handling platform where they are loaded into the anesthetic tank. Adults collected are anesthetized with CO_2, and subsequently either selected for broodstock or returned to the river. The operation of the facility has no effect on the critical habitat for summer steelhead.

5.2) Fish transportation equipment (description of pen, tank truck, or container used).

No broodstock are transported. Fish are held on site.

5.3) Broodstock holding and spawning facilities.

Three Mile Falls Dam - Since 1997, all fall Chinook spawning for the yearling program has occurred at Three Mile Falls Dam. Since 2007, all broodstock for the entire program have been held and spawned at Three Mile Falls Dam. The facility includes a water intake system with automatic screen cleaning, pump station with a pumping capacity of 8,000 gpm, six adult holding ponds, (90' x 10' x 5' feet with effective water volume of 4,500 ft^3), mechanical fish crowder, visitor facilities including restrooms, standby generator, chemical storage, bunkhouse and spawning buildings. The bunkhouse includes two bunkrooms, kitchen area, office space, conference room, shop, and restrooms. The spawning building includes a fish lift, electroshock anesthesia system, sorting and spawning facilities, wet and dry storage rooms, walk-in cooler/freezer, and restroom.

5.4) Incubation facilities.

Umatilla Hatchery - Green eggs are transported from Three Mile Falls Dam, in five-gallon buckets with water and ice. Umatilla Hatchery incubation equipment consists of four separate units of Marisource incubators (Heath tray type). Water can be used directly from wells or mixed with chilled water. Three units can be supplied with well water at 12.2°C (54°F) or mixed with chilled water 7.2°C (45°F) for any combination of temperatures from 7.2-12.2°C (45-54°F) provided that 300 gpm of chilled water is not exceeded. The fourth unit can be mixed with water chilled to 3.3°C (38°F) to achieve any combination of temperatures from 3.3-12.2°C (38–54°F) provided that 60 gpm of chilled water is not exceeded.

Numerous systems continually monitor temperature, mechanical systems, electrical systems, and flow. Alarms will sound if any system fails or is out of criteria. Continual monitoring of systems and their maintenance will prevent system failure. An emergency gas powered pump installed in the aeration tower structure supplies water for incubation in the event of aeration lift pump failure. In the event of total system failure resulting in total loss of water, eggs may be transported to Irrigon hatchery (if they are still operational and have necessary space).

Pathogen free water is used for incubating all programs at Umatilla Hatchery. This is a direct preventive measure for minimizing the risk of introducing pathogens into the hatchery program, thus minimizing the risks to fish in the natural environment after fish are released. Sanitary measures are taken at Umatilla Hatchery to prevent transmission of pathogens from one stock to another by disinfecting equipment with iodophor.

Bonneville Hatchery – Bonneville Hatchery receives eyed eggs from Umatilla Hatchery for the yearling program. Incubation facilities consist of 8 rows of 19 double-stacked Heath vertical incubators with 16 trays that use 5 gpm of well water each.

5.5) Rearing facilities.

Umatilla Hatchery - Umatilla Hatchery has three different types of rearing units. There are eight 21' Canadian style early rearing tanks located in the main building adjacent to incubation. Water is pumped to the aeration tower and gravity fed to the tanks. The Canadian early rearing tanks are not used for the fall Chinook program.

Umatilla Hatchery has 10 Oregon style ponds and the fall Chinook subyearlings are started in one of these ponds. Rearing dimensions are 91'x18.75'x3.67'. These ponds are designed for serial reuse in groups of two ponds, upper and lower. They also can be supplied with fresh water individually, if necessary. When densities reach 3,000 pounds these fish are split into two Oregon ponds, just prior to tagging operations. The fish are marked into four equally sized groups, in four Oregon Ponds.

Umatilla Hatchery also has 24 Michigan style ponds, with rearing dimensions of 91'x9'x2.75'. Water is supplied to these ponds in reuse only groups of three ponds each.

Each pond has a submersible pump that supplies 950 gpm of water to oxygen contact columns, located at the head of each pond. Oxygen is introduced and unwanted saturated gas is removed from incoming water at this point. Each pond has its own oxygen supply line. Supplemental oxygen is delivered from a bulk liquid tank on site. The Michigan ponds are not used for the fall Chinook program.

All ponds have a high-low water level alarm. The Michigan ponds also have pump failure and oxygen flow alarms. In the event of total system failure, fish could be moved to nearby Irrigon Hatchery if pond space is available and all logistics were in place prior to the time of failure. Monitoring and maintenance of the water supply system occurs on a regular basis.

Pathogen free water is used for all production at Umatilla Hatchery. This is a direct preventive measure for minimizing risk of introducing pathogens into the hatchery phase of the program, thus minimizing the risks to fish in the natural environment after these fish are released. Sanitary measures are taken at Umatilla Hatchery to prevent transmission of pathogens from one stock to another by disinfecting equipment in iodophor. In addition, a fish health program is in place to monitor and evaluate the health status of fall Chinook juveniles reared at Umatilla Hatchery.

Bonneville Hatchery – The Umatilla River fall Chinook fry shall be reared in 11 concrete raceways (80' x 20' x 30" each) using water from Tanner Creek. Water is supplied from the aeration tower and gravity fed to the raceways.

5.6) Acclimation/release facilities.

Pendleton Acclimation Facility – The facility includes a water intake structure with automatic screen cleaner, pump station with three vertical turbine pumps (two primary and one backup), standby generator, water head box/distribution system, storage building, four acclimation ponds (approximately 13,000 cubic feet each), settling pond, and water outlet and fish release structure. Water is supplied by gravity flow to the pump station where it is pumped into the head distribution box. Water is then supplied by gravity from the head distribution box to the individual ponds. Water flow is approximately 1,600 gpm per pond. The ponds are covered with netting to prevent bird predation.

In case of power failure, pump failure, screen cleaning failure, or low water level alarm, a phone dialer will begin calling ten telephone numbers repeatedly until someone acknowledges the alarm. Fish are released from the facility by pulling the pond outlet screen and dam boards, lowering the pond, and crowding out the fish using a seine. The fish then exit the pond through an underground pipe to the Umatilla River. In an extreme emergency, the fish are also released in this manner. ODFW Fish Health Service personnel are available to address disease concerns.

In case of power failure, pump failure, screen cleaning failure or low water level alarm, a phone dialer will begin calling ten telephone numbers repeatedly until someone acknowledges the alarm. Fish are released from the facility by pulling the pond outlet

screen and dam boards, lowering the pond, and crowding out the fish using a seine. The fish then exit the pond through an underground pipe to the Umatilla River. In an extreme emergency, the fish are also released in this manner. ODFW Fish Health Service personnel are available to address disease concerns.

5.7) Describe operational difficulties or disasters that led to significant fish mortality.

Umatilla Hatchery - There has been no significant fish loss.
Bonneville Hatchery - There has been no significant fish loss.
Pendleton Acclimation Facility - There has been no significant fish loss.
Three Mile Falls Dam - There has been no significant fish loss.

5.8) Indicate available back-up systems, and risk aversion measures that will be applied, that minimize the likelihood for the take of listed natural fish that may result from equipment failure, water loss, flooding, disease transmission, or other events that could lead to injury or mortality.

N/A for this program because the propagated fish are not ESA-listed.

SECTION 6. BROODSTOCK ORIGIN AND IDENTITY

Describe the origin and identity of broodstock used in the program, its ESA-listing status, annual collection goals, and relationship to wild fish of the same species/population.

6.1) Source.

With the exception of the first release in 1982 (Tule stock), only Upriver Bright stock fall Chinook have been used in the program. This stock is not ESA-listed.

6.2) Supporting information.

6.2.1) History.

The program was initiated in 1982 with the release of Tule fall Chinook from Bonneville and Spring Creek NFH. Beginning in 1983, and continuing to the present, Upriver Bright stock fall Chinook broodstock from various sources (Bonneville Hatchery, Priest Rapids Hatchery, Little White Salmon NFH, and adult returns to the Umatilla River) have been used for the Umatilla River program. Since 1997, however, all fall Chinook broodstock for the yearling program have been collected from the Umatilla River and beginning in 2007, all brood for the entire program have come from returns to the Umatilla River.

6.2.2) Annual size.

The number of fall Chinook broodstock collected for holding/spawning from 1997 to 2006 for the yearling program, ranged from 586 to 630. The subyearling program during that period was conducted using eggs received from Priest Rapids Hatchery.

The program has been modified as per suggestions made by the PAC of the *US v Oregon*. Accordingly, the current program shall use only hatchery-origin fish returning to the Umatilla River. The near term collection target for the subyearling program only is ~450 adults. The long term goal to produce both programs is an estimated. 1,150 adults.

6.2.3) Past and proposed level of natural fish in broodstock.

Historically, there was no goal established for naturally-produced fish in the broodstock. In the past, naturally-produced fish were included randomly as part of the general population during collections from Three Mile Falls Dam and it is assumed that random inclusion of natural adults also occurred at Priest Rapids Hatchery. A “stepping stone” program was initiated with the 2008 brood in which two groups of fish were propagated; one of the groups focused on meeting harvest objectives using 100% hatchery-origin broodstock and the other group focused on meeting conservation objectives using 50.5% natural-origin fish as broodstock. The “stepping stone” program was discontinued with the 2013 brood year. The current modified program shall not use any natural fish as broodstock.

6.2.4) Genetic or ecological differences.

The Umatilla River indigenous fall Chinook salmon was extirpated from the basin in the early 1900's. To reestablish the lost fall Chinook salmon population within the basin, a hatchery program was started using initially tule fall Chinook (1982). Since 1983, only Upriver Bright stock fall Chinook from various sources has been used for the Umatilla program. It is therefore presumed that, the population that has been reestablished within the basin is basically of hatchery-origin offspring where some genetic differences may have been established due to the use of broodstock from different sources/locations. In the past, broodstock for spawning consisted of both marked and unmarked fish, and it is therefore expected that, a minor difference between the hatchery and natural populations may have existed although no studies at the molecular level were conducted for confirmation.

6.2.5) Reasons for choosing.

Upriver Bright stock was selected for reestablishment of fall Chinook salmon in the Umatilla River as it was likely the same or genetically similar or closely related population that was originally extirpated from the Umatilla River.

6.3) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic or ecological effects to listed natural fish that may occur as a result of broodstock selection practices.

Fall Chinook existed sympatrically with steelhead in the Umatilla Basin. It is unlikely that broodstock selection practices for fall Chinook have any impact on listed steelhead.

SECTION 7. BROODSTOCK COLLECTION

7.1) Life-history stage to be collected (adults, eggs, or juveniles).

All fish collected for broodstock are adults.

7.2) Collection or sampling design.

Brood are collected at the Three Mile Falls Dam east bank adult facility from September through mid-November. Monthly collection rates for both adults and jacks are established prior to the return season by averaging the bi-monthly return percentages for each over the last five years. Adults are collected at a 1:1 male to female ratio. Jacks are not incorporated into the broodstock.

7.3) Identity.

Only one population of fall Chinook is present in the Umatilla River. Natural origin fish are unmarked while all hatchery origin fish are either ad-clipped and/or contain a coded wire tag (CWT). In the future, all hatchery origin fish will be adipose clipped and wire tagged. A detector is used at Three Mile Falls Dam to check unmarked fish for the presence of coded wire tags. Only hatchery origin adults will be collected for brood.

7.4) Proposed number to be collected:

7.4.1) Program goal (assuming 1:1 sex ratio for adults):

Assuming broodstock mortality (10%), an average fecundity (3,400 eggs/F), 1:1 sex ratio, and past survival rates (~75% survival from egg to juvenile) of Umatilla River fall Chinook salmon, the collection goal for the subyearling program is ~450 adults and ~750 adults for the yearling program. A total of ~2.0M green eggs are needed to produce 1.5M juveniles annually.

7.4.2) Broodstock collection levels for the last twelve years (e.g. 2001-2012), or for most recent years available:

Table 9. Number of fall Chinook broodstock collected, egg collected, and juvenile release numbers, 2001-2012.

Year	Adults			Subyearlings		Yearlings	
	Females	Males	Jacks	Eggs	Juveniles	Eggs	Juveniles
2001	232	231	24	716,549	620,012	716,549	509,135
2002	273	259	32	670,000	624,789	678,122	477,065
2003	197	191	19	670,000	608,202	681,594	437,465
2004	410	384	39	661,895	603,323	520,453	469,724
2005	207	207	19	670,000	628,476	493,523	427,721
2006	194	190	19	669,372	615,859	545,507	496,048
2007	450	428	43	779,550	342,729[a]	504,433	466,974
2008	461	438	47	843,633	620,891	538,862	482,189
2009	406	414	35	747,579	645,488	706,787	457,702
2010	390	384	5	713,202	562,855	664,376	494,186
2011	373	297	74	680,585	543,818	562,420	452,421
2012	389	389	4	722,185	611,108	554,891	490,695

[a] High mortality at Thornhollow Acclimation Facility

7.5) Disposition of hatchery-origin fish collected in surplus of broodstock needs.

All hatchery fish returning to Three Mile Falls Dam in excess of those needed for broodstock are released upstream. These fish are given the opportunity to spawn naturally and may also be available for harvest.

7.6) Fish transportation and holding methods.

No transportation of fall Chinook broodstock occurs as fish are held on site (Three Mile Falls Dam facility). Adults for spawning are held in concrete ponds. There are six ponds at the facility, each pond is 90' x 10' x 5' feet with an effective water volume of 4,500 ft^3. Holding densities have ranged from approximately 3.6 to 7.3 cubic feet per adult and flow rates have varied from approximately 2.2 to 19.0 gpm per adult. The current broodstock goal is for 1,586 adults and 0-79 jacks. A maximum density of adult fish in holding ponds shall be approximately 9.9 cubic feet per adult and flow rate of 1.75 gpm per adult. The mortality rates of brood fish held at Three Mile Falls Dam has ranged from 0.7 to 13.4.0% and has averaged 7.6%. However, the broodstock collection goal was established assuming 10% pre-spawn mortality.

7.7) Describe fish health maintenance and sanitation procedures applied.

Adults retained for broodstock prior to the onset of spawning are injected with oxytetracycline (10 mg/kg) and erythromycin (20 mg/kg) at Three Mile Falls Dam.

During holding, hydrogen peroxide is dripped into the inflowing water to achieve a maximum concentration of 100 ppm active ingredient. The treatment is applied for one hour to control fungus and parasites three times per week.

7.8) Disposition of carcasses.

All fall Chinook broodstock carcasses are buried in the regional landfill.

7.9) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic or ecological effects to listed natural fish resulting from the broodstock collection program.

Brood collection for fall Chinook will have no genetic impacts on ESA-listed summer steelhead. To minimize ecological effects, any listed summer steelhead caught during brood collection will either be released unharmed with minimal handling stress or used as brood for steelhead propagation program, which has been described in a separate HGMP.

SECTION 8. MATING

Describe fish mating procedures that will be used, including those applied to meet performance indicators identified previously.

8.1) Selection method.

Beginning the first week of November, all broodstock are sorted once or twice per week for maturation.. All ripe females will be spawned on a given spawn day until the egg goals are met. Enough ripe males will be randomly selected on a given spawn day to fertilize the available females from that group.

8.2) Males.

Males are used at a proposed rate of one ripe male for every ripe female and are randomly selected. No backup males are typically used, however in some cases milt is pooled when not enough males are available on a given day to spawn the available females at a 1:1 ratio.

8.3) Fertilization.

A 1:1 spawning ratio is utilized whenever possible and matings are random. Females are killed and bled by severing the caudal peduncle. The undersides of the fish are cleansed with a solution of Argentyne and are then wiped with a clean towel. The eggs from each female are stripped into a colander to remove excess ovarian fluid and then placed into individual buckets.

Males are killed, cleansed with Argentyne, and the milt is stripped directly into the eggs (one male per female). After the milt is added, well water from Umatilla Hatchery is added and the eggs and sperm are mixed and allowed to stand for approximately one minute or longer. The fertilized eggs from each bucket are then drained and the eggs from up to four females are combined. The eggs are then rinsed using well water from Umatilla Hatchery and again drained. Eggs are then placed into a solution of Argentyne and allowed to water harden for one hour. At the end of the hour, the eggs are again drained and placed into a bucket of fresh well water with ice and a watertight lid for transport to Umatilla Hatchery. Colanders, spawning knives and other equipment are disinfected with Argentyne between each family group.

At the time the males and females are stripped, ovarian fluid samples are taken to test for replicating viral agents. After spawning, pyloric caeca, kidney and spleen samples are also taken to test for bacterial kidney disease and other culturable pathogens.

Additional fish health procedures used for disease prevention include; 1) water hardening of eggs using a 100 ppm iodophor solution for a minimum of 15 minutes to control vertical transmission of pathogens including IHNV and 2) culling of eggs based on both gross observation of infected females and ELISA titers to control vertical transmission of

BKD (*R. Salmoninarum*). The goal of the program is to only use eggs from females with OD values <0.200.

In addition, other techniques employed to help prevent transmission of pathogens during the spawning process include; 1) draining of ovarian fluid from eggs of individual females, 2) 10 minute disinfection in iodophor at Umatilla Hatchery upon arrival from Three Mile Falls Dam, and 3) annual fish health monitoring of Umatilla fall Chinook brood stock to detect any virus or replicating agents or bacterial pathogens. Results are listed in annual reports downloaded to the BPA web site.

8.4) Cryopreserved gametes.

No cryopreserved gametes are used in the Umatilla Fall Chinook Program.

8.5) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic or ecological effects to listed natural fish resulting from the mating scheme.

It is unlikely that mating schemes used in the fall Chinook program have any impact on listed steelhead.

SECTION 9. INCUBATION AND REARING -

Specify any management *goals* (e.g. "egg to smolt survival") that the hatchery is currently operating under for the hatchery stock in the appropriate sections below. Provide data on the success of meeting the desired hatchery goals.

9.1) Incubation.

9.1.1) Number of eggs taken and survival rates to eye-up and/or ponding.

The number of Umatilla fall Chinook salmon eggs taken in the past and their survival rates are presented in Table 10. The proposed number of green eggs take is 2.0M, which is expected to produce about 1.5 million juveniles.

Table 10. Egg take and survival of Fall Chinook taken from Three Mile Falls Holding Facility (Umatilla River Stock) and reared at Bonneville for brood Years 97-98 & 2000-2012.

Brood Year	Number Eggs taken	Green-Eyed Egg Survival (%)
1997	515,281	70
1998	256,511	69
1999[a]		
2000	1,081,481	71
2001	716,549	82
2002	678,122	75
2003	681,594	84
2004	1,364,578	81
2005	640,321	77
2006	660,780	85
2007	1,211,983	78
2008[b]	1,598,385	88
2009	706,787	85
2010	664,376	91
2011	562,420	93
2012	554,891	88

[a] Egg's were shipped green to Bonneville in BY 1999.
[b] 171,000 fry incorporated in Umatilla hatchery sub-yearling program.

9.1.2) Cause for, and disposition of surplus egg takes.

The Umatilla fall Chinook Program traditionally stays within the IHOT guidelines of ±10% of egg take goal, and no additional eggs are taken.

9.1.3) Loading densities applied during incubation.

Umatilla Hatchery – The hatchery has four isolated units or sections of Marisource (Heath tray type) incubators as described in section 5.4.1. Loading densities do not exceed 8,000 eggs/tray, and 7,300 eyed eggs/tray.

Bonneville Hatchery – Eyed eggs are received from Umatilla Hatchery. Little White

Salmon NFH will be shipping green eggs. Both green eggs and eyed eggs are loaded at 5,500 eggs per Marisource (Heath) tray with 5 gpm flow.

9.1.4) Incubation conditions.

Umatilla Hatchery-- Oxygen saturation levels average 9 ppm influent and 8 ppm effluent. Water flows are regulated to a minimum of 4 gpm, with individual egg take temperatures ranging from 38 to 54^{o}F.

Bonneville Hatchery-- Transfer of eyed eggs from Umatilla to Bonneville Hatchery for the yearling program occurs in early January. Green eggs will be received from Little White Salmon NFH in November. Eggs are loaded for transport at 10,000 eggs/tray in aluminum Heath boxes. As eggs incubate, they are visually monitored until hatching begins. At this time, the tray lids are lightly brushed each day to clear dissolving shells. Eggs are incubated in well water of 50^{o}F and running total TU's recorded daily. DO's and silt management are not any concern.

9.1.5) Ponding.

Umatilla Hatchery - Fall Chinook fry are ponded mid-February at 1,750 temperature units and at approximately 1,000 fish to the pound when they are 100% buttoned-up.

Bonneville Hatchery-- Ponding is considered when the fry accumulate between 1800 – 1850 temperature units. At this time, a sample of fry is removed from individual trays and viewed under light to determine percentage of button up eggs. The desired percentage of button up eggs for ponding is 99.9%.

9.1.6) Fish health maintenance and monitoring.

Umatilla Hatchery--Eggs brought to Umatilla Hatchery are disinfected in 100 ppm iodophor for 10 minutes. Fungus is controlled with formalin treatments at a concentration of 1,667 ppm. Treatments are scheduled seven times per week for 15 minutes. Little mortality has been attributed to yolk-sac malformation. After eyeing, dead eggs are removed by machine and hand-picking. The eyed eggs are inventoried at this time.

Bonneville Hatchery-- Upon arrival, eyed eggs are disinfected in an Argentyne bath at 100 ppm for 10 minutes. No subsequent treatments are performed. Eggs are visually checked for fungus growth activity or other problems that may occur as they complete the incubation process. Before ponding, fry are picked to remove dead eggs and malformed fry and loss is enumerated.

9.1.7) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic and ecological effects to listed fish during incubation.

It is unlikely that fall Chinook incubation at either Bonneville or Umatilla Hatchery will

have any adverse genetic impacts on listed steelhead. However, see Section 9.1.6. for treatment and preventive measures during incubation which will prevent transmission of diseases to wild populations.

9.2) Rearing:

9.2.1) Provide survival rate data (*average program performance*) by hatchery life stage (fry to fingerling; fingerling to smolt) for the most recent twelve years (1988-99), or for years dependable data are available.

Table 11. Egg take and survival of Priest Rapids Stock (1997-2006) and Umatilla Stock (2007-2012) for Umatilla Hatchery Subyearling program Fall Chinook (brood years 1997-2012) reared at Umatilla Hatchery.

Brood Year	No. of eggs taken or received	Survival of egg-to-fry (%)	Survival of egg-to-smolt (%)
1997	3,847,000	82	69
1998	3,400,000	59	54
1999	4,380,000	72	69
2000	1,268,120[b]	55	44
2001	670,000[c]	93	93
2002	670,000[c]	90	93
2003	670,000[c]	93	91
2004	1,464,578[d]	97	89
2005	670,000[c]	98	94
2006	669,372[c]	94	92
2007	950,837[c]	62	36[a]
2008	839,768[c]	97	74
2009	676,871[c]	97	95
2010	713,202	80	79
2011	680,585	81	80
2012	722,185	92	91

[a]High mortality at Thornhollow Acclimation Facility.
[b] Total includes 205,000 eyed eggs received.
[c]Eyed Eggs received
[d]100,000 eyed eggs from Priest Rapids stock and 1,364,578 green eggs from Umatilla River stock were used for the subyearling program in 2004.

Table 12. Survival rates Umatilla ChF at Bonneville Fish Hatchery, 1997-2011.

Brood Year	No. of fry ponded	Survival of fry to fingerling (%)	Survival of fingerling to smolt (%)
1997	475,000	N/A	N/A
1998	538,400	99.9	98.8
1999	542,000	97.9	98.5
2000	645,625	99.9	87.0
2001	549,652	99.7	97.9
2002	499,549	99.4	93.0
2003	557,081	N/A	N/A
2004	511,260	99.0	97.4
2005	485,071	99.5	88.3
2006	536,251	99.3	92.6
2007	495,186	99.6	94.4
2008	530,736	[a]	90.9[b]
2009	533,741	[a]	85.7[b]
2010	550,242	[a]	89.8[b]
2011	518,213	[a]	87.8[b]

[a] Fingerling data was not recorded
[b] Survival of fry to smolt

9.2.2) Density and loading criteria (goals and actual levels).

Umatilla Hatchery – Densities and loadings at Umatilla Hatchery are reported in Appendix Table 9. Fry are reared in Oregon style ponds with a density of 1.0 pound/ft^3, loading of 5.0 lbs/gpm, and water exchange rates of 1.6 times/hour. Actual final densities are 0.6 pounds/ft^3, and 3.0 pounds/gpm.

Bonneville Hatchery - Loading goals in standard raceways for fry to smolt stage is at maximum density index of 0.3 and flow index of 1.7.

9.2.3) Fish rearing conditions.

Umatilla Hatchery - The final rearing of current program fish is exclusively in Oregon style ponds at Umatilla Hatchery (refer to section 5.5). Fish are fed at least once every hour by mechanical feeder. Ponds are cleaned once per week, with waste being flushed to settling ponds and water quality monitored as per NPDES permit requirements. Mortalities are removed once per day. Dissolved oxygen is monitored weekly or as needed. Water flow rates are monitored weekly and temperature varies from 52^{o}F to 61^{o}F. Dissolved oxygen levels are maintained at or above 8 ppm. Ammonia and total gas saturation levels have not been a problem. Data of all of monitoring activities are recorded (Appendix Tables 7 and 8).

Bonneville Hatchery - After ponding, fry are monitored during feeding and cleaning activities. Mortality is removed daily and ponds are cleaned twice a week in the early

rearing stages and then once a week in later stages. Water flows are checked weekly. Fish growth (number of fish per pound) is checked once a week during early rearing, and once a month during later stages. Water flows are adjusted as per requirement (Appendix Table 12).

9.2.4) Indicate biweekly or monthly fish growth information (*average program performance*), including length, weight, and condition factor data collected during rearing, if available.

Table 13. Average growth of fall Chinook subyearlings (fish/lb) and food conversion ratios at Umatilla Hatchery observed in Brood Year 2002.

Month	Fish/lb	Conversion
February	520	1.1
March	150	1.0
April	79	1.25
May	48	1.1

Table 14. Monthly growth of Umatilla stock fall Chinook yearlings (fish/lb) at Bonneville Hatchery.

Month	Fish/lb
March	610
April	413
May	311
June	146
July	58
August	31
September	21
October	15.4
November	14.6
December	14
January	13.1
February	13
March	10.8

9.2.5) Indicate monthly fish growth rate and energy reserve data (*average program performance*), if available.

Umatilla Hatchery – See Table 13 for monthly fish growth (#fish/lb) and food conversion ratios. No energy reserve data are available.

Bonneville Hatchery - See Table 14 for monthly fish growth (#fish/lb). No energy reserve data are available.

9.2.6) Indicate food type used, daily application schedule, feeding rate range (e.g. B.W./day and lbs/gpm inflow), and estimates of total food conversion efficiency during rearing (*average program performance*).

Umatilla Hatchery--Fall Chinook are fed Bio-vita starter and Bio-vita fry feed. Fish are fed every half hour up to 34 times per day by mechanical feeders at approximately 1.8%-4.2% of body weight. See Table 13 for fish growth and food conversion efficiency at Umatilla Hatchery.

Bonneville Hatchery - Fall Chinook yearlings are fed Bio-Oregon Bio-Vita starter initially, with Bio-Clark's fry feed fed for the remainder of their rearing. Fish are fed 12 to 2 times per day at approximately 2.5%-0.25% of body weight. See Table 14 for fish growth during rearing at Bonneville Hatchery.

9.2.7) Fish health monitoring, disease treatment, and sanitation procedures.

Umatilla Hatchery-- Monthly fish health inspection follows specific protocols described in the Umatilla Fish Health Monitoring and Evaluation work statement. Each species and stock at Umatilla Hatchery is monitored monthly for pathogens and parasites. A minimum of 10 moribund or dead fish per stock are tested for systemic bacteria. All moribund or dead Chinook are examined for *R. salmoninarum* by the DFAT or ELISA method.

Other Infections - Juvenile fish are treated for bacterial infections if necessary with Aquaflor (florfenicol) under an Investigational New Animal Drug Permit (INAD).

Sanitation Procedures – ODFW's Fish Health Management Policy (September 12, 2003) provides guidelines for preventative and therapeutic fish health strategies that will be followed in this program

Table 15. Disease history (2004 to 2009) of Umatilla River fall Chinook adults at Three Mile Falls Dam Adult Facility and juveniles reared at Umatilla Hatchery[a].

Disease or Organism	Adults	Juveniles
IHN Virus	No	No
EIBS Virus	No	No
Aeromonas salmonicida	Yes	No
Aeromonas/Pseudomonas	Yes	Yes
Flavobacterium psychrophilum	Yes	Yes
Fl. columnare	No	No
Renibacterium salmoninarum	Yes	No
Yersinia ruckeri	No	No
Carnobacterium sp.	No	No
Ichthyobodo	No	No
Gyrodactylus	No	No
Ichthyophthirius multifilis	No	No
Epistylis	No	No
Scyphidia	No	No
Trichodinids	No	No
Gill Copepods	Yes	No
Coagulated Yolk Disease	No	Yes
External Fungi	Yes	Yes
Internal Fungi	Yes	No
Myxobolus cerebralis	No	No
Ceratomyxa shasta	Yes	No

[a] "Yes" indicates detection of the pathogen but in many cases no disease or fish loss was associated with presence of the pathogen. "No" indicates the pathogen has not been detected in that stock.

Bonneville Hatchery-- While being reared at Bonneville the Umatilla fall Chinook program receives monthly health exams performed by ODFW Fish Health Service. During rearing, the program fish receive one feeding of Aquamycin; usually in the fall when their size is about 20 fish/lb. Sanitation procedures are conducted prior to ponding, and then the ponds are pressure washed. During the rearing period mortality is removed daily and ponds are cleaned weekly.

9.2.8) Smolt development indices (e.g. gill ATPase activity), if applicable.

Umatilla Hatchery – see Appendix Table 11. No gill ATPase activities are measured.

Bonneville Hatchery – see Appendix Table 14. No gill ATPase activities are measured.

9.2.9) Indicate the use of "natural" rearing methods as applied in the program.

Umatilla Hatchery - None used.

Bonneville Hatchery - None Used.

9.2.10) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic and ecological effects to listed fish under propagation.

It is unlikely that fall Chinook rearing protocols at either Bonneville or Umatilla Hatchery will have any adverse genetic impacts on listed steelhead. However, to minimize ecological impacts and transmission of diseases to wild populations, a fish health monitoring plan for the program fish is implemented during fish rearing period (see Section 9.2.7).

SECTION 10. RELEASE

Describe fish release levels, and release practices applied through the hatchery program.

Target release sizes for the program are 40 fpp for subyearling and 10 fpp for yearlings. The larger sized releases are an attempt to improve SAR. Although there is concern that the advanced size may increase early maturation, it is anticipated that the large release size will also return more adults.

10.1) Proposed fish release levels.

Table 16. Proposed fish release levels, protocols (direct or acclimated), release dates and locations.

Age Class	Maximum Number	Size (fpp)	Release Date	Location
Eyed Eggs	75,000[a]			McKay Creek
Unfed Fry				
Fry				
Fingerling (sub-yearling)	600,000	40 fpp	May	Umatilla River @ RM 48 (Reith)
Yearling smolts	780,000 120,000	10 fpp 10 fpp	March March	Pendleton AF (RM 56) Pendleton – Direct Release

[a] Placeholder for outlets of surplus production

10.2) Specific location(s) of proposed release(s).

Stream, river, or watercourse: Umatilla River
Release point: Pendleton Acclimation Facility (RM 56)
Major watershed: Umatilla River
Basin or Region: Mid-Columbia River

Stream, river, or watercourse: Umatilla River
Release point: Reith Bridge (RM 48)
Major watershed: Umatilla River
Basin or Region: Mid-Columbia River

10.3) Annual numbers and sizes of fish released by age class through the program.

Table 17. Actual numbers and sizes of fish released by age class, 1992-2014.

Release year	Eggs/ Unfed Fry	Avg size	Fall Rel.	Avg size	Subyearling Spring Rel.	Avg size	Yearling	Avg size
1992					3,190,549	60.6	220,440	7.7
1993					2,659,598	63.0	134,837	9.1
1994					2,865,386	65.4	283,453	10.0
1995					2,466,298	63.5	227,088	8.0
1996					2,960,413	65.8	564,403	6.4
1997					2,580,833	72.1	519,921	10.0
1998					2,777,442	66.7	436,010	9.3
1999					1,842,666	55.9	449,568	9.2
2000					3,020,519	48.5	469,756	10.5
2001					646,996	38.6	400,761	9.5
2002					620,063	39.8	520,564	8.8
2003					624,789	55.4	509,135	11.7
2004					608,202	41.2	477,065	9.8
2005					603,323	80.6	437,465	10.9
2006					628,476	63.6	469,724	9.9
2007					615,859	52.7	427,721	11.1
2008					342,729	48.4	496,048	13.6
2009					620,891	44.2	466,974	9.4
2010					645,488	39.5	482,189	9.7
2011					562,855	34.5	457,702	12.2
2012					543,818	39.9	494,186	12.5
2013					611,108	49.5	452,421	16
2014					623,162	58.8	490,695	15.6
Average					937,552	52.9	466,940	9.7

10.4) Actual dates of release and description of release protocols.

See Table 16 for acclimated and direct releases and months of fish releases.

10.5) Fish transportation procedures, if applicable.

Umatilla Hatchery – Fall Chinook sub-yearlings are loaded with water using a fish pump. Fish are separated from the water and transferred into insulated liberation tankers ranging in capacity from 2,000 to 5,000 gallons. Fish are loaded at maximum rate of 1.0 lb/gallon. Transport time from Umatilla Hatchery to Reith Bridge is approximately one and a half hours. Supplemental oxygen and aeration is provided and temperature is monitored during transport.

Bonneville Hatchery—Fall Chinook smolts are loaded with water using a fish pump. Fish are separated from the water and transferred into insulated liberation tankers ranging in capacity from 2,000 to 5,000 gallons. Fish are loaded at maximum rate of 1.0 lb/gallon. Transport time from Bonneville Hatchery to the acclimation sites is approximately three hours. Supplemental oxygen and aeration is provided and temperature is monitored during transport.

10.6) Acclimation procedures.

All the yearling production except for the 120,000 direct stream group is acclimated at the Pendleton Acclimation Facility before release. The 120,000 yearling direct stream group is also released at the Pendleton Acclimation Facility. The sub-yearling group of 600,000 smolts is direct stream released at Reith Bridge.

Pendleton Acclimation Facility – The yearling production will be acclimated in two groups. The first group will arrive in early to mid-February and be acclimated for ~3 weeks. The second group will arrive in early March and be acclimated for ~2 weeks. The fish are fed Bio Clark Fry Feed twice each day at rate of approximately 0.25 to 0.50% BWD. Mortalities are removed daily and ODFW Fish Health personnel are available to address specific disease concerns. Temperature and dissolved oxygen measurements are also taken daily during acclimation. A volitional release is initiated one week prior to force out. To initiate the volitional release, the effluent pond screen(s) is removed and the fish are allowed to swim over a notched dam board and through an underground pipe directly into the Umatilla River. Fish continue to be fed during the volitional release period up until one or two days before the remaining fish are released. They are then taken off feed to reduce stress during the force out. The remaining fish are released by lowering the pond(s) and crowding the fish out using a seine. On the day of release, ODFW personnel sample some fish (weight and length).

10.7) Marks applied, and proportions of the total hatchery population marked, to identify hatchery adults.

With the program modifications, all 600,000 sub-yearling and 900,000 yearling smolts

shall be adipose fin-clipped and wire tagged.

10.8) Disposition plans for fish identified at the time of release as surplus to programmed or approved levels.

Fish reared to full term smolt are released as part of the production program. Fish surplus to programmed needs would be outplanted or culled as eggs.

10.9) Fish health certification procedures applied pre-release.

Umatilla Hatchery - All monitoring will be consistent with the ODFW Fish Health Policy. Within four weeks prior to release a grab-sampled fish of each species and stock are examined as follows:

- Kidney for *R. salmoninarum* by ELISA from a minimum of 60 fish per brood year.
- Gill tissue and body scrapings by microscopy from a minimum of five fish.
- Gill/kidney/spleen tissue pools (5 fish per pool) from 10 fish per raceway for culturable viruses.

Bonneville Hatchery - Standard fish health pre-release protocols as with other stocks at Bonneville Hatchery will be applied.

10.10) Emergency release procedures in response to flooding or water system failure.

Pendleton Acclimation Facility – Fish are released from the facility by pulling the pond outlet screen and dam boards, lowering the pond, and crowding out the fish using a seine. The fish then exit the pond through an underground pipe to the Umatilla River. In an extreme emergency, the fish are also released in this manner.

10.11) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic and ecological effects to listed fish resulting from fish releases.

Smolt releases are made high in the Umatilla Basin to minimize straying of adults into the Snake River basin. Yearling releases are also acclimated. In addition, all hatchery fish released will be marked with an adipose clip and wire tagged. Subyearlings are released during the expected natural migration time for subyearling fall Chinook to encourage outmigration. This period is after the primary outmigration period for natural steelhead smolts.

SECTION 11. MONITORING AND EVALUATION OF PERFORMANCE INDICATORS

11.1) Monitoring and evaluation of "Performance Indicators" presented in Section 1.10.

11.1.1) Describe plans and methods proposed to collect data necessary to respond to each "Performance Indicator" identified for the program.

The Comprehensive Research, Monitoring, and Evaluation Plan for Umatilla Subbasin Summer Steelhead and Chinook Salmon was finalized in January 2006. M&E activities described in Section 2.2.3 are included in the plan although additional evaluations are proposed. Additional funding would be required to implement the entire Plan.

11.1.2) Indicate whether funding, staffing, and other support logistics are available or committed to allow implementation of the monitoring and evaluation program.

Funding and staff are not available to implement all the tasks outlined in the M&E Plan. However, the tasks associated with the Performance Indicators identified in Section 1.10 are funded. The following is a list of unfunded fall Chinook monitoring and evaluation tasks that should be implemented.

- At the time this HGMP was drafted there had been no funding allocated by the Army Corps of Engineers to the Umatilla Hatchery Monitoring and Evaluation Project for monitoring and evaluation of yearling fall Chinook reared at Bonneville Hatchery. Funding is necessary for PIT tagging related expenses, to cover personnel time and miscellaneous expenses involving smolt release monitoring, fish health monitoring, data analyses and reporting, and creel monitoring.
- Expand the existing Umatilla River Juvenile Outmigration and Survival Project (BPA project no. 1989-024-01), which monitors only steelhead, to include sampling for spring and fall Chinook, and coho salmon. Estimated cost: $250,000 annually.
- A study to investigate embryonic early imprinting as a solution to the Umatilla Hatchery subyearling fall Chinook straying problem. Based on coded-wire tagging and recovery, from run years 1995 to 2009 an average of 44.8% of adults produced from subyearling releases that reached the mouth of the Umatilla River bypassed the river and were recovered in the Snake and upper Columbia rivers. Straying of subyearling origin adults is high compared to fall Chinook salmon adults originating from yearling releases into the Umatilla River (1995 – 2009 avg. = 26.1%), indicating that Umatilla River conditions are suitable for returning adults. Acclimation has not decreased straying. This 4-year study, conducted collaboratively with the Oregon Hatchery Research Center and NOAA Fisheries, would experimentally evaluate whether fall Chinook salmon that are incubated from the eyed-egg to alevin stages on Umatilla River water exhibit improved homing back to the Umatilla River compared to a control group that are incubated conventionally on Umatilla well water. A line item budget has not been developed, however, the cost to differentially mark and tag fish is already accounted for because the Umatilla Hatchery Monitoring and Evaluation Project receives funding to wire tag all subyearling production. Some

equipment may already be owned by ODFW or collaborators. We anticipate expenses to be proportionally small relative to the potential importance of this study's findings.

- Increase the number of PIT tags for the subyearling fall Chinook release from 800 (current number) to 2,000. Current PIT-tagging level is insufficient to monitor outmigration survival. Cost: $3,500 annually for tags (1,200 @ 1.82/tag), needles, and temporary services help.

11.2) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic and ecological effects to listed fish resulting from monitoring and evaluation activities.

Trapping, handling, and tagging protocols are implemented to minimize negative effects on listed steelhead.

SECTION 12. RESEARCH

12.1) Objective or purpose.

The ongoing research or Umatilla River M&E program is designed to:

- Document hatchery rearing, release activities, and subsequent adult returns.
- Determine success of the program in meeting mitigation goals and index annual smolt survival and adult returns to the Umatilla River.
- Provide management recommendations aimed at improving program effectiveness and efficiency.
- Provide management recommendations aimed at reducing program impacts on ESA-listed fish.
- Document the efficacy of program modification objectives of reducing Columbia River tributary straying by returning adults.

12.2) Cooperating and funding agencies.

- Confederated Tribes of the Umatilla Indian Reservation
- Bonneville Power Administration
- Bureau of Reclamation

12.3) Principle investigator or project supervisor and staff.

- Lance R. Clarke
- Richard W. Carmichael
- William A. Cameron

12.4) Status of stock, particularly the group affected by project, if different than the stock(s) described in Section 2.

Same as described in Section 2.

12.5) Techniques: include capture methods, drugs, samples collected, tags applied.

Research, monitoring, and evaluation methods are described in section 11

12.6) Dates or time period in which research activity occurs.

Research activity occurs throughout the year.

12.7) Care and maintenance of live fish or eggs, holding duration, transport methods.

ESA-listed fish will not be handled outside the capture site. Fish will be held in containers with aerated well water at suitable temperatures. If handling involves more

than determining species and enumeration, fish will be anesthetized and allowed to recover before release. Transport will use water-filled containers and fish will not be held longer than two hours.

12.8) Expected type and effects of take and potential for injury or mortality.

Monitoring and evaluation will involve take of all types. Most take will involve observing, capture and handling, and capture, handling and marking (Table 10). Injury due to capture, marking, and tissue sampling is inevitable but generally temporary in nature. Few fish, however, succumb to the effects of such injuries. This mortality, in addition to occasional direct loss due to capture and handling, account for the lethal take estimates that may occur during monitoring and evaluation activities (Table 8).

12.9) Level of take of listed fish: number or range of fish handled, injured, or killed by sex, age, or size, if not already indicated in Section 2 and the attached "take table".

See Table 8.

12.10) Alternative methods to achieve project objectives.

The use of cast nets or other devices to monitor hatchery/wild ratios in spawning areas has been considered. However, this type of sampling represents greater risk to sampled fish, increases sample bias, and reduces expected sample size when compared to the trapping strategy set forth.

Observation via snorkeling will be used in place of electrofishing for sampling in suitable streams and where collection of hatchery smolts is not required.

12.11) List species similar or related to the threatened species; provide number and causes of mortality related to this research project.

Due to our inability to differentiate between listed anadromous and non-listed resident forms of *O. Mykiss*, take estimates include both. Occasionally, we expect to encounter bull trout during sampling. However, the numbers of encounters are low; therefore, the level of mortality is expected to be very low.

12.12) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse ecological effects, injury, or mortality to listed fish as a result of the proposed research activities.

- ESA-listed steelhead and bull trout sampled during the residual research and monitoring activities will be collected in compliance with NMFS electrofishing guidelines to minimize the risk of injury.

- Efforts will be made to insure that adult trapping facilities do not delay movement of ESA-listed fish, including daily trap checks.

SECTION 13. ATTACHMENTS AND CITATIONS

CITATIONS:

BOR (U. S. Bureau of Reclamation). 1988. Umatilla Basin Project Oregon planning report – Final environmental impact statements. BOR Pacific Northwest Region, Boise, Idaho.

Boyce, R.R. 1986. A comprehensive plan for rehabilitation of anadromous fish stocks in the Umatilla river basin. Final report of Oregon Department of Fish and Wildlife to Bonneville Power Administration, Portland, Oregon.

BPA (Bonneville Power Administration). 1987. Environmental Assessment: Umatilla Hatchery. Office of Power and Resources Management, Portland, Oregon.

Clarke, L. R., W. A. Cameron, R. W. Stonecypher, and R. W. Carmichael. 2009. Umatilla monitoring and evaluation annual report: 2008. Annual Report to the Bonneville Power Administration, Project 1990-005-00, Portland, Oregon.

Clarke, L. R., W. A. Cameron, R. S. Hogg, and R. W. Carmichael. 2014. Umatilla monitoring and evaluation annual report: 2013. Annual Report to the Bonneville Power Administration, Project 1990-005-00, Portland, Oregon.

CTUIR and ODFW (Confederated Tribes of the Umatilla Indian Reservation and Oregon Department Fish & Wildlife). 1989. Umatilla Hatchery Master Plan. Report for the Northwest Power Planning Council, Portland, Oregon.

CTUIR and ODFW (Confederated Tribes of the Umatilla Indian Reservation and Oregon Department Fish & Wildlife). 1990. Umatilla River subbasin salmon and steelhead production plan. Report to the Northwest Power Planning Council, Portland, Oregon.

Groberg, W.J. Jr., N.H. Hurtado, S.T. Onjukka and K. Waln. 1994. Umatilla Hatchery monitoring and evaluation: Report B Fish health monitoring and evaluation. Annual Report 1994. Annual Report for Project Number 90-005. Bonneville Power Administration, Portland, Oregon.

Hayes, M.C., R.W. Carmichael, S.M. Focher, W.J. Groberg, Jr., S.T. Onjukka, R.W. Stonecypher, Jr., and K. Waln. 1996b. Umatilla Hatchery Monitoring and Evaluation. Annual progress report to Bonneville Power Administration, Portland, Oregon.

IHOT. 1995. Integrated Hatchery Operations Team: Policies and Procedures for Columbia Basin Anadromous Salmonid Hatcheries, 1994 Annual Report. Annual Report to the Bonneville Power Administration, Portland, Oregon.

Keefe, M.L., R.W. Carmichael, S.M. Focher, W.J. Groberg and M.C. Hayes. 1994. Umatilla Hatchery monitoring and evaluation: Annual Report 1993. Annual Report for Project Number 90-005. Bonneville Power Administration, Portland, Oregon.

NMFS. 2007. Section 7 Biological Opinion On USFWS Artificial Propagation Programs in the Lower Columbia and Middle Columbia River. November 27, 2007. NMFS, Portland, Oregon.

NMFS (National Marine Fisheries Service). 2008. Proposed middle Columbia River steelhead distinct population segment ESA recovery plan, September, 2008.

Reeve, R., S. Williams, J. Neal and J. Sanchez. 1988. Umatilla River Drainage Anadromous Fish Habitat Improvement Implementation Plan. March 1988, Available from: Bonneville Power Administration, Portland, Oregon, 53 pages.

USFWS. 2004. Hatchery and Genetics Management Plan Little White Salmon/Willard NFH Complex Upriver Bright Fall Chinook Salmon. U.S. Fish and Wildlife Service. Portland, Oregon.

Young, W., D. Milks, S. Rosenberger, B. Sandford, and S. Ellis. 2013. Snake River Fall Chinook Salmon Run Reconstruction. Submitted to 2013 Fall Chinook Hatchery Program Review Symposium, Lower Snake River Compensation Plan, U.S. Fish and Wildlife Service, Boise.

SECTION 14. CERTIFICATION LANGUAGE AND SIGNATURE OF RESPONSIBLE PARTY

"I hereby certify that the information provided is complete, true and correct to the best of my knowledge and belief."

Name and Title of Applicant: Kevin Blakely, John Day Watershed District Manager, ODFW, Pendleton.

Signature: _____ Date: _____

Certified by: Scott Patterson, Fish Propagation Program Manager, ODFW, Salem.

Signature: _____ Date: _____

SECTION 15. PROGRAM EFFECTS ON OTHER (AQUATIC OR TERRESTRIAL) ESA-LISTED POPULATIONS. (Anadromous salmonid effects are addressed in Section 2)

15.1) List all ESA permits or authorizations for USFWS ESA-listed, proposed, and candidate salmonid and non-salmonid species associated with the hatchery program.

The UBNPME project monitoring and evaluation activities are conducted under USFWS Section 10 permit #TE-844468-8. ODFW monitoring and evaluation activities are conducted under a Section 6 agreement between the State of Oregon and the United States Fish and Wildlife Service.

The USFWS Biological Opinion for the Umatilla Hatchery Program, Bonneville Power Administration, Umatilla and Wallowa counties, Oregon and Walla Walla County, Washington (USFWS ref # 13420-2008-F-0109) provides Section 7 coverage for incidental take of bull trout under these programs.

15.2) Describe USFWS ESA-listed, proposed, and candidate salmonid and non-salmonid species and habitat that may be affected by hatchery program.

Other Listed Species:

Common Name	Scientific Name	Status
Fish:		
Bull trout [1]	*Salvelins confluentus*	Threatened

[1] listing unit is the Columbia River Distinct Population Segment

Columbia Basin bull trout (*Salvelinus confluentus*) are listed as Threatened and occur in the project area. There are at least two bull trout life history types in the Umatilla Basin; resident and fluvial. The ad-fluvial life history type, which includes bull trout that migrate down to the mainstem Columbia River, likely exists at an extremely low level as seven adults have been observed at Three Mile FallsThreemile Dam since 1995. In the Umatilla River some fish have been observed as far down as Pendleton; but most are found in upper mainstem areas above Gibbon.

Within the Umatilla Basin bull trout status has been highly variable (Table 18) but is generally considered to be viable. In recent years, redd counts in the Umatilla River have declined. Hatchery juveniles may provide a forage base benefit to bull trout.

Table 18. Number of Bull Trout redds observed annually in the Umatilla River, 1994 – 2008 (source: Paul Sankovich, USFWS, La Grande, OR).

Bull Trout Redds, Umatilla Basin		
Year	**Total Redd**	**Redds in Index Sites**
1994	42	29
1995	24	19
1996	37	28
1997	32	32
1998	84	81
1999	153	144
2000	143	128
2001	103	99
2002	53	48
2003	49	43
2004	56	45
2005	28	28
2006	25	24
2007	13	13
2008	19	19

Proposed for listing. None

Candidate species for listing.

Common Name	Scientific Name
Columbia spotted frog	*Rana luteiventris*
Washington ground squirrel	*Spermophilus washingtoni*
Yellow-billed Cuckoo	*Coccyzus americanus*
Western Boreal Toad	*Bufo boreas*

Critical habitat: The subbasin has been designated as critical habitat for bull trout.

15.3) <u>Analyze effects.</u>

4.10 Summary of Effects [from the USFWS Biological Opinion, see above]
The proposed action is not expected to cause any habitat effects; therefore, the effects of the Project elements are expected to be limited to direct and indirect effects to bull trout. The release of over one million hatchery-raised Chinook, steelhead, and Coho smolts into the Umatilla River, each year, will likely result in direct or indirect interactions between the hatchery-raised fish and bull trout. Hatchery fish will eat prey, occupy space in the river, provide food for predators, influence nutrient flow through carcasses, and potentially introduce pathogens (Pearsons et al. 2007, Pearsons and Hopley 1999).

Based on Project timing and location, all life stages of bull trout (except fry) will most likely be exposed to at least some type of effect from the Project within the action area. A small number of bull trout may be temporarily disrupted from their normal behavior during Project activities such as adult broodstock collection, smolt releases, and adult releases. However, these effects are not expected to significantly disrupt behavior

patterns of bull trout. Additionally, based on past experience with Project activities, the Service expects death or significant injury to be extremely rare from Project activities and only associated from activities at Three Mile Falls Dam. Project activities are not likely to adversely affect bull trout local populations in the Umatilla and Walla Walla River core areas and effects to the Umatilla-Walla Walla Recovery Unit are likely to be minimal.

15.4) Actions taken to minimize potential effects.

The USFWS Biological Opinion contains one reasonable and prudent measure: Minimize the amount and extent of incidental take associated with adult collection activities at Three Mile Falls Dam. To implement Reasonable and Prudent Measure #1 (collection activities), the project proponents must:
a. Ensure bull trout captured at Three Mile Falls Dam are held in a separate container, and if transport is warranted, bull trout are transported separate from anadromous salmonids, and released at a safe but different location than the anadromous salmonids.
b. Ensure bull trout captured at Three Mile Falls Dam are released as quickly as possible.
c. Record all observations of bull trout and report this information to the Service on an annual basis. Reports should be sent, by January 31 of each year, to:
Field Supervisor
La Grande Field Office
3502 Highway 30
La Grande, OR 97850

15.5) References

CTUIR, et al.. Umatilla/Willow Subbasin Plan. Prepared for the Northwest Power and Conservation Council, Portland, Oregon.

USFWS, 2008. Biological Opinion for the Umatilla Hatchery Program, Bonneville Power Administration, Umatilla and Wallowa counties, Oregon and Walla Walla County, Washington (USFWS ref # 13420-2008-F-0109), September 12, 2008.

APPENDICES

Appendix Table 1. Smolt-to-adult survival, number of adults produced, and percent of adults that were harvested out-of-basin, returned to the Umatilla River, or strayed for the Umatilla yearling fall Chinook hatchery program, brood years 1981-2007. Yearling smolts produced in brood years 1987-1989 were not coded-wire tagged.

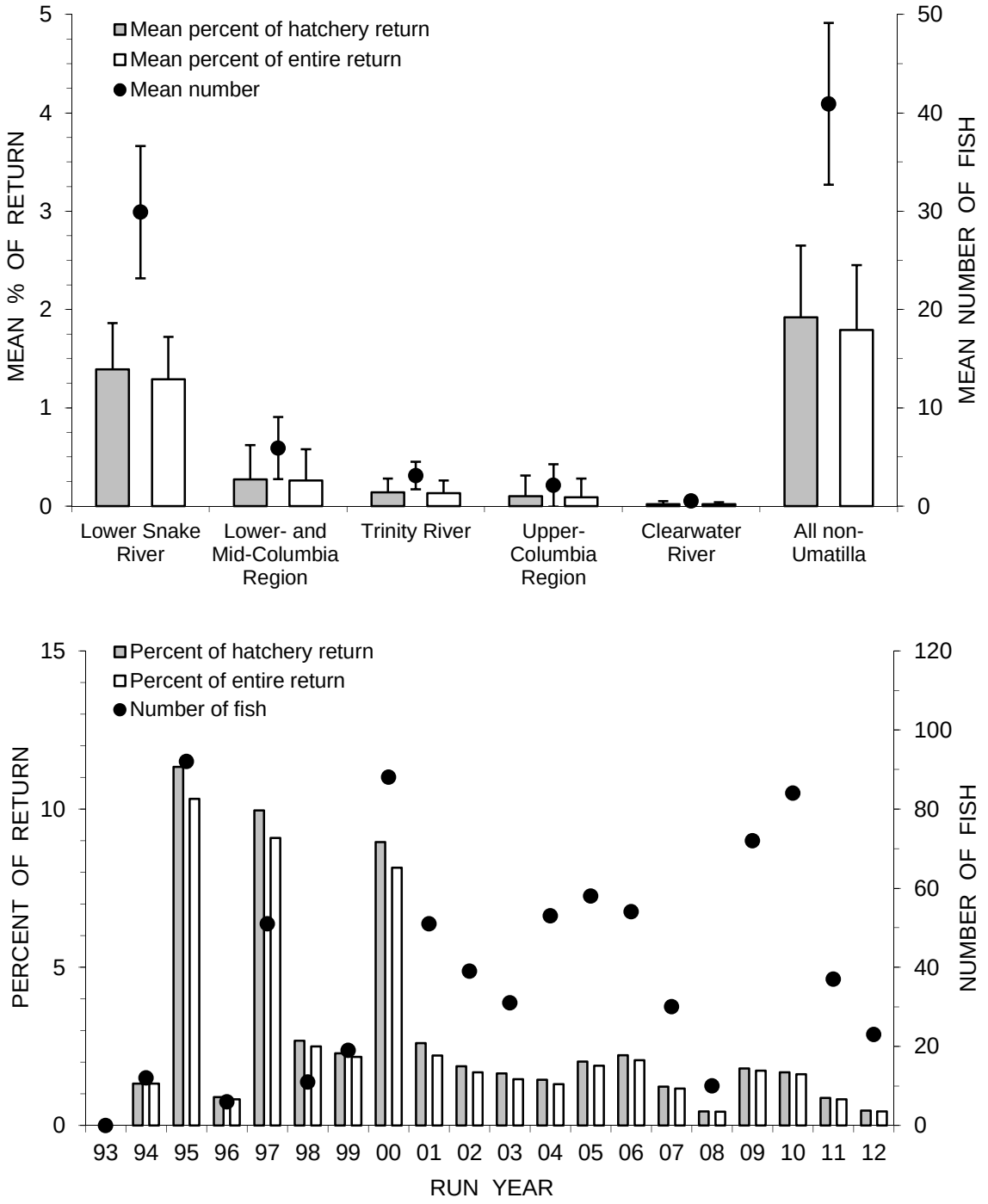
Brood Year	Size-at Release (fish/lb)	Percent Smolt-to-Adult Survival	No. Adults Produced	Percent of Adults Harvested Out-of-Basin	Percent of Adults Returned to Umatilla R.	Percent of Adults Strayed
1981	5.9	0.2	160	98.1	0.0	100
1982	8.6	0.1	175	94.9	0.0	100
1983	7.8	0.8	1,545	95.1	0.1	97.3
1984	5.0	3.1	6,428	94.0	2.0	70.2
1985	8.3	2.4	4,973	86.6	7.0	44.5
1986	9.4	2.4	4,785	86.3	10.6	23.7
1990	7.7	<0.1	43	87.8	12.2	0.0
1991	8.9	<0.1	51	40.2	27.3	32.5
1992	10.0	0.1	370	50.7	43.6	5.7
1993	8.0	0.1	119	29.6	62.4	8.0
1994	6.4	0.1	351	54.2	40.7	5.1
1995	10.0	0.4	2,150	51.3	21.7	27.0
1996	9.3	0.2	736	38.2	54.2	7.6
1997	9.3	0.1	431	45.2	44.4	10.4
1998	10.5	2.2	10,304	56.1	22.0	21.9
1999	9.5	1.2	5,561	55.4	33.7	10.9
2000	8.8	1.3	6,252	49.8	44.9	5.3
2001	11.7	1.3	6,084	45.6	46.7	7.7
2002	9.8	0.8	3,693	43.5	51.8	4.7
2003	10.9	0.8	3,287	47.8	44.9	7.3
2004	10.4	1.5	6,817	51.7	36.8	11.5
2005	11.1	1.0	4,440	41.6	51.0	7.4
2006	13.6	3.1	15,532	40.0	53.8	6.2
2007	9.4	1.0	4,713	55.7	41.4	2.9
10 Year Mean	**10.6**	**1.43**	**6,730**	**48.7**	**42.7**	**8.6**

Appendix Table 2. Smolt-to-adult survival, number of adults produced, and percent of adults that were harvested out-of-basin, returned to the Umatilla River, or strayed for the Umatilla subyearling fall Chinook hatchery program, brood years 1981-2008.

Brood Year	Size-at Release (fish/lb)	Percent Smolt-to-Adult Survival	No. Adults Produced	Percent of Adults Harvested Out-of-Basin	Percent of Adults Returned to Umatilla R.	Percent of Adults Strayed
1981	88.3	0.48	18,159	99.0	0.0	1
1983	85.1	0.79	7,661	78.0	0.0	22.0
1984	92.3	0.86	27,618	91.5	0.2	8.3
1985	86.0	0.51	10,300	78.5	0.0	21.5
1986	60.2	0.83	12,259	84.2	2.0	13.8
1987	68.3	0.13	2,416	79.6	10.4	10.0
1988	66.6	0.11	2,716	71.5	6.8	21.7
1989	87.5	0.22	6,745	58.1	7.5	34.3
1990	81.1	0.13	4,316	57.2	20.8	22.0
1991	62.2	<0.01	68	30.7	69.3	0.0
1992	62.1	0.07	1,833	54.9	35.8	9.3
1993	65.2	0.08	2,239	54.1	26.8	19.0
1994	63.4	<0.01	56	85.3	14.7	0.0
1995	65.8	0.09	2,564	38.7	37.6	23.7
1996	66.9	0.04	951	49.2	29.9	20.9
1997	66.6	0.04	1,069	26.9	13.3	59.8
1998	55.8	0.27	4,877	42.6	20.9	36.5
1999	48.5	0.18	5,373	58.0	13.9	28.1
2000	38.6	0.07	454	50.0	26.2	23.8
2001	39.8	0.10	681	41.3	43.2	15.6
2002	55.4	0.02	142	33.8	33.8	32.4
2003	39.6	0.06	384	43.5	33.3	23.2
2004	76.9	0.01	46	52.2	45.7	2.2
2005	63.5	0.18	1,111	50.1	29.2	20.7
2006	52.6	0.04	255	59.6	36.1	4.3
2007	44.1	1.10	3,753	48.3	21.7	30.0
2008	39.5	0.12	1,515	39.8	52.9	7.3
10 Year Mean	**49.9**	**0.19**	**1,371**	**47.7**	**33.6**	**18.7**

Appendix Table 3. Fall Chinook salmon returns to the Umatilla River mouth, 1985-2012. Minijacks are precocious returns from yearling smolts released a few months earlier in spring.

	HATCHERY			NATURAL			TOTAL		
Year	Adult	Jack	Minijack	Adult	Jack	Subjack	Adult	Jack	Minijack
1985	---	---	NA	---	---	0	6	79	NA
1986	---	---	NA	---	---	0	28	407	NA
1987	---	---	195	---	---	0	53	139	195
1988	---	---	1,268	---	---	0	91	195	1,268
1989	---	---	65	---	---	0	271	267	65
1990	---	---	618	---	---	0	329	113	618
1991	---	---	273	---	---	0	522	468	273
1992	---	---	---	---	---	0	241	43	59
1993	---	---	15	---	---	0	379	28	15
1994	---	---	390	---	---	0	699	233	390
1995	548	278	369	60	20	0	608	298	369
1996	611	68	769	50	12	0	661	80	769
1997	325	275	285	40	15	0	365	290	285
1998	273	155	297	16	16	0	289	171	297
1999	720	123	196	21	22	0	741	145	196
2000	614	408	5,491	47	56	0	661	464	5,491
2001	983	1,038	1,073	171	173	0	1,154	1,211	1,073
2002	1,538	597	2,044	193	54	0	1,731	651	2,044
2003	1,338	602	2,275	176	65	0	1,514	667	2,275
2004	2,151	1,563	2,146	300	113	0	2,451	1,676	2,146
2005	2,076	859	943	154	43	0	2,230	902	943
2006	2,028	474	4,690	147	47	0	2,175	521	4,690
2007	1,416	1,052	1,115	76	44	0	1,492	1,096	1,115
2008	1,319	953	4,010	78	16	0	1,397	969	4,010
2009	1,250	2,846	1,524	42	125	0	1,292	2,971	1,524
2010	3,842	1,324	2,620	108	101	0	3,950	1,425	2,620
2011	1,922	2,459	682	136	114	0	2,058	2,573	682
2012	2,823	2,249	2,015	255	211	0	3,078	2,460	2,015
95-12 Mean	**1,432**	**962**	**1,808**	**115**	**69**	**0**	**1,547**	**1,032**	**1,808**
85-12 Mean							**1,088**	**734**	**1,363**



Appendix Figure 1. Non-Umatilla origin adult and jack hatchery fall Chinook salmon enumerated at Three Mile Falls Dam, Umatilla River, Oregon, run years 1993-2012. Top: Mean and SE for number of fish by smolt release origin and their percent contribution to the hatchery and entire return to Three Mile Falls Dam. Bottom: Total number of non-Umatilla origin fish by run year and their percent contribution to the hatchery and entire return to Three Mile Falls Dam.

Appendix Table 4. Fall Chinook spawning escapement comprised of returns passed above Three Mile Falls Dam (TMFD) and outplants form Priest Rapids Hatchery, run years 1996-2007. Data include excess brood released above TMFD at the end of spawning operations. Adult outplant mean is for 1996-2004.

Run Year	Returns Passed Above TMFD				Percent of Adult Return	Outplants		Total	
	Hatchery		Natural						
	Adult	Jack	Adult	Jack		Adult	Jack	Adult	Jack
1996	125	47	10	8	26.2	708	0	843	55
1997	39	120	3	11	30.8	940	0	982	131
1998	94	100	4	14	48.2	200	0	298	114
1999	268	79	17	20	43.9	891	0	1,176	99
2000	102	250	7	49	37.8	471	0	580	299
2001	553	877	124	165	74.6	943	0	1,620	1,042
2002	1,113	459	170	50	76.8	854	0	2,137	509
2003	934	492	142	62	76.9	737	0	1,813	554
2004	1,284	1,406	226	108	74.3	612	0	2,122	1,514
2005	1,656	769	122	39	84.2	0	0	1,778	808
2006	1,655	377	104	42	83.1	0	0	1,759	419
2007	660	976	41	43	67.3	0	0	701	1,019
2008	528	846	14	9	60.8	0	0	542	855
2009	530	2,716	8	116	81.2	0	0	538	2,832
2010	3,178	1,129	30	89	85.2	0	0	3,208	1,218
2011	1,277	2,289	46	108	83.0	0	0	1,323	2,397
2012	2,131	1,886	155	180	84.5	0	0	2,286	2,066
Mean	**949**	**872**	**72**	**65**	**65.8**	**706**	**0**	**1,394**	**937**

Appendix Table 5. Contributions of fall Chinook salmon from the Umatilla Hatchery Program to fisheries outside of the Umatilla River Basin, 1985-2012. Harvest reporting for recent years may be incomplete.

Year	Ocean Fisheries	COLUMBIA RIVER			**TOTAL**
		Tribal Fisheries	Non-Tribal Commercial Fishery	Non-Tribal Recreational Fishery	
1985	453	1,876	23	30	**2,382**
1986	1,766	483	817	0	**3,066**
1987	5,570	2,201	2,399	242	**10,412**
1988	8,684	6,317	4,406	270	**19,677**
1989	8,498	6,847	2,373	222	**17,940**
1990	7,876	5,278	911	314	**14,379**
1991	1,996	1,010	511	49	**3,566**
1992	1,872	460	10	6	**2,348**
1993	1,703	1,043	2	5	**2,753**
1994	1,668	692	9	0	**2,369**
1995	700	214	0	91	**1,005**
1996	287	580	61	27	**955**
1997	550	192	0	169	**911**
1998	283	214	0	43	**540**
1999	938	341	48	116	**1,443**
2000	449	503	100	83	**1,135**
2001	648	507	175	182	**1,512**
2002	3,281	1,349	226	429	**5,285**
2003	4,376	1,117	481	395	**6,369**
2004	2,122	639	225	362	**3,348**
2005	2,853	948	204	78	**4,083**
2006	1,310	704	113	8	**2,135**
2007	1,261	613	124	102	**2,100**
2008	1,726	1,170	172	197	**3,265**
2009	2,056	987	129	302	**3,474**
2010	2,848	1,944	379	299	**5,470**
2011	1,786	685	221	341	**3,033**
2012	8,498	692	175	314	**2,382**
Mean	**2,502**	**1,441**	**523**	**162**	**4,628**

Appendix Table 6. Annual angling effort, harvest, and catch of fall Chinook salmon in the Umatilla River non-tribal fishery, run years 1992-2012. Adult harvest reported is from an approximately 200 m reach of the Umatilla River downstream of Highway 730 that is considered part of the Columbia River per Oregon angling regulations.

Run Year	No. anglers inter-viewed	Total hours fished	No. HARVESTED			No. RELEASED			PERCENT OF RETURN HARVESTED		
			Adult	Jack	Subjack	Adult	Jack	Subjack	Adult	Jack	Subjack
1992	562	2,210	2	16	22	10	51	49	0.8	37.2	37.3
1993	639	1,666	9	1	1	4	0	0	2.4	3.6	6.3
1994	596	2,898	10	17	48	8	44	125	1.4	7.3	11.0
1995	517	2,206	5	10	31	29	2	45	0.8	3.4	8.4
1996	665	2,803	15	0	163	48	0	64	2.3	0.0	21.2
1997	434	2,742	11	83	95	42	22	35	3.0	28.6	33.3
1998	549	3,299	3	17	67	43	9	28	1.0	9.9	22.6
1999	779	4,868	4	8	44	47	13	48	0.5	5.5	22.4
2000	1,001	4,467	18	27	543	42	8	196	2.7	5.8	9.9
2001	1,005	6,082	8	53	103	145	16	35	0.7	4.4	9.6
2002	995	6,944	15	34	335	475	25	191	0.9	5.2	16.4
2003	1,263	8,064	32	29	125	456	37	156	2.1	4.3	5.5
2004	763	4,158	19	38	111	104	17	51	0.8	2.3	5.2
2005	853	4,982	15	45	23	374	36	19	0.7	5.0	2.4
2006	835	5,283	19	55	230	161	63	268	0.9	10.6	4.9
2007	516	4,578	4	29	116	278	25	97	0.3	2.6	10.4
2008	803	5,753	3	66	149	126	13	35	0.2	6.8	3.7
2009	984	6,886	10	104	51	173	60	4	0.8	3.5	3.3
2010	489	6,213	5	175	187	71	22	0	0.1	12.3	7.1
2011	943	6,361	13	135	25	370	65	1	0.6	5.2	3.7
2012	833	5,688	23	367	413	895	243	75	0.7	14.9	20.5
Mean	**768**	**4,674**	**12**	**62**	**137**	**185**	**38**	**72**	**1.1**	**8.5**	**12.6**

Appendix Table 7. Water quality in first and second pass Michigan and Oregon raceways used to rear yearling fall Chinook salmon in 1992-95 brood years. Means without letters are not significantly different at P>0.05.

	Michigan		Oregon	
Parameter measured	N	Mean	N	Mean
Sampling period	Jul 24 - Feb 15		Jul 24 - Feb 15	
Temperature head (°C)	58	13.4	63	13.3
Temperature tail (°C)	58	13.4	63	13.5
pH head	56	7.8	61	7.8
pH tail	56	7.8	61	7.8
Oxygen head (ppm)	56	11.1a	61	10.1b
Oxygen tail (ppm)	56	9.4a	61	8.5b
Nitrogen head (mmHg)	56	590a	61	601b
Nitrogen tail (mmHg)	56	604a	61	619b
Total pressure-head (mmHg)	56	756	61	752
Total pressure-tail (mmHg)	56	747	61	748
Unionized ammonia (µg/l)	26	0.68	30	0.61
Alkalinity (mg/l $CaCO_3$)	28	132	32	134

Appendix Table 8. Water quality in Michigan series used to rear subyearling fall Chinook salmon at Umatilla Fish Hatchery from brood years 1995-1997. Years 1996 and 1997 were reared at three different densities.

	Fish Rearing Density		
Parameter measured	200K	300K	400K
Year →		**1995**	
Temperature head (d-C)		12.4	
Temperature tail (d-C)		12.6	
pH head		8.0	
pH tail		7.9	
Oxygen head (ppm)		12.0	
Oxygen tail (ppm)		9.6	
Nitrogen head (mmHg)		565	
Nitrogen tail (mmHg)		571	
Total pressure-head (mmHg)		743	
Total pressure-tail (mmHg)		716	
Unionized ammonia (ug/l)		0.15	
Alkalinity (mg/l CaCO3)		129	
Year →		**1996**	
Temperature head (d-C)	12.0	11.6	11.8
Temperature tail (d-C)	11.9	11.8	11.7
pH head	7.7	7.7	7.7
pH tail	7.7	7.7	7.7
Oxygen head (ppm)	10.9	11.3	11.6
Oxygen tail (ppm)	8.8	9.3	9.2
Nitrogen head (mmHg)	553	559	582
Nitrogen tail (mmHg)	542	555	596
Total pressure-head (mmHg)	726	732	752
Total pressure-tail (mmHg)	687	704	732
Unionized ammonia (ug/l)	1.49	1.35	1.77
Alkalinity (mg/l CaCO3)	137	140	143
Year →		**1997**	
Temperature head (d-C)	11.4	11.5	11.7
Temperature tail (d-C)	11.4	11.5	11.8
pH head	7.6	7.6	7.6
pH tail	7.5	7.6	7.5
Oxygen head (ppm)	11.4	11.3	10.2
Oxygen tail (ppm)	9.2	9.0	7.7
Nitrogen head (mmHg)	580	559	589
Nitrogen tail (mmHg)	595	590	598
Total pressure-head (mmHg)	743	749	741
Total pressure-tail (mmHg)	726	720	710
Unionized ammonia (ug/l)	1.45	2.28	N/A
Alkalinity (mg/l CaCO3)	133	134	139

Appendix Table 9. Rearing conditions immediately before transfer for subyearling fall Chinook salmon reared in Oregon series at Umatilla Hatchery in 2000-2012brood years.

Brood year	Oregon rearing series	Mean number per raceway	Maximum density ($lb/ft^{3)}$	Maximum loading (lb/gal/min)	Number reared per gpm
2000	O1	162,878	0.47	4.5	130
	O2	161,142	0.51	2.5	129
2001	O1	153,882	0.51	2.5	123
	O2	156,449	0.70	3.3	125
2002	O1	157,036	0.34	1.6	126
	O2	155,753	0.54	2.6	125
2003	O1	149,937	0.52	2.5	120
	O2	154,405	0.67	3.2	124
2004	O2	154,761	0.33	3.2	124
	O3	147,026	0.28	2.7	118
2005	O3	154,161	0.31	3.0	123
	O2	160,196	0.48	4.5	128
2006	O1B, O1A	153,341	0.49	4.6	123
	O2	154,851	0.48	4.6	124
2007	O2	149,985	0.42	4.0	120
	O3	139,740	0.55	5.3	112
2008	O2	157,497	0.62	5.9	126
	O1	152,949	0.56	5.3	122
2009	O1	161,038	0.67	6.4	129
	O2	161,707	0.70	6.7	129
2010	O1	140,040	0.69	6.6	112
	O2	141,388	0.68	6.5	113
2011	O1	137,325	0.50	4.8	110
	O2	135,334	0.56	5.3	108
2012	O1	165,540	0.56	5.3	132
	O2	163,214	0.56	5.3	131

Appendix Table 10. Mean length, weight, and condition factor at transfer for subyearling fall Chinook salmon reared in Michigan or Oregon raceways at Umatilla Hatchery, 1996-2012 brood years.

Brood year	System	Density (*1000) or strategy	Pass	Length (mm)	Weight (g)	Condition factor
1996	Michigan	200	A	75.4	4.9	1.11
			B	77.3	5.3	1.12
			C	79.7	5.9	1.14
		300	A	79.5	5.6	1.06
			B	78.3	5.8	1.16
			C	78.0	5.3	1.08
		400	A	75.5	4.9	1.10
			B	77.9	5.4	1.11
			C	78.1	5.7	1.17
1997	Michigan	200	A	77.9	4.9	1.03
			B	77.3	4.6	0.97
			C	78.5	5.4	1.07
		300	A	77.3	4.8	1.08
			B	79.3	4.4	0.89
			C	77.6	4.7	0.97
		400	A	78.0	4.5	1.00
			B	76.6	3.7	0.82
			C	75.3	4.4	1.00
1998	Michigan	200	A	79.6	5.5	1.07
			B	79.3	5.8	1.20
		300	A	82.5	6.3	1.14
			B	76.9	5.2	1.13
		400	A	75.8	4.6	1.07
			B	77.5	6.4	1.19
1999	Michigan	200	A	88.8	8.1	1.14
			B	86.1	7.3	1.12
			C	87.3	7.7	1.11
		300	A	88.4	8.2	1.17
			B	84.9	7.5	1.20
			C	90.3	8.4	1.12
		400	A	85.1	7.5	1.19
			B	84.0	7.1	1.18
			C	87.0	7.9	1.18
2000	Oregon		A	88.3	7.8	1.20
			B	87.3	7.7	1.20

Table 10. (continued)

Brood year	System	Density (*1000) or strategy	Pass	Length (mm)	Weight (g)	Condition factor
2001	Oregon	Thornhollow	A	87.6	8.0	1.20
		Thornhollow	B	87.3	7.5	1.13
		Direct release	A	98.1	10.9	1.13
		Direct release	B	97.1	10.3	1.14
2002	Oregon	Thornhollow		85.5	6.3	1.04
		Direct release	A	88.8	8.0	1.16
		Direct release	B	89.7	8.1	1.15
2003	Oregon	Thornhollow		86.7	6.9	1.07
		Direct release		98.2	11.9	1.21
2004	Oregon	Direct release	A	84.5	6.9	1.15
		Direct release	B	83.5	6.7	1.12
2005	Oregon	Thornhollow		88.0	7.1	1.03
		Direct release	A	87.1	7.0	1.08
		Direct release	B	90.3	7.4	1.06
2006	Oregon	Thornhollow	A	85.8	7.2	1.12
		Thornhollow	B	91.4	8.9	1.16
		Direct release		92.9	8.7	1.07
2007	Oregon	Thornhollow		92.9	8.5	1.05
2008[a]	Oregon	Direct release		95.3	9.4	1.10
2009[a]	Oregon	Direct release	A	96.3	9.7	1.11
	Oregon	Direct release	B	98.9	12.0	1.22
2010[a]	Oregon	Direct release		101.0	13.2	1.18
2011[a]	Oregon	Direct release		98.9	11.4	1.13
2012[a]	Oregon	Direct release		91.1	9.2	1.17

[a] Measurements recorded at time of release not transfer

Appendix Table 11. Smoltification proportions and proportion of descaled, partially descaled, and undamaged subyearling fall Chinook salmon reared in Oregon raceways at Umatilla Hatchery, brood years2000-2012.

				Smolting				Descaling	
Brood year	System	Release Strategy	Raceway	Smolt	Intermediate	Parr	Descaled	Partially descaled	Undam -aged
2000	Oregon	Thornhollow	1A,1B	0.00	1.00	0.00	0.00	0.00	1.00
		Direct release	2A,2B	0.00	1.00	0.00	0.00	0.00	1.00
2001	Oregon	Thornhollow	1A,1B	0.00	1.00	0.00	0.00	0.00	1.00
		Direct Release	2A,2B	0.00	1.00	0.00	0.00	0.00	1.00
2002	Oregon	Thornhollow	1A,1B	0.00	1.00	0.00	0.00	0.00	1.00
		Direct release	2A	0.00	1.00	0.00	0.00	0.00	1.00
		Direct release	2B	0.00	1.00	0.00	0.00	0.00	1.00
2003	Oregon	Thornhollow	1A,1B	0.00	1.00	0.00	0.00	0.00	1.00
		Direct release	2A,2B	0.00	1.00	0.00	0.00	0.00	1.00
2004	Oregon	Direct release	2A,3A	0.00	1.00	0.00	0.00	0.00	1.00
		Direct release	2B,3B	0.00	1.00	0.00	0.00	0.00	1.00
2005	Oregon	Thornhollow	3A,3B	0.00	1.00	0.00	0.00	0.00	1.00
		Direct release	2A	0.00	1.00	0.00	0.00	0.00	1.00
		Direct release	2B	0.00	1.00	0.00	0.00	0.00	1.00
2006	Oregon	Thornhollow	1A	0.00	1.00	0.00	0.00	0.00	1.00
		Thornhollow	2B	0.00	1.00	0.00	0.00	0.00	1.00
		Direct release	1B,2A	0.00	1.00	0.00	0.00	0.00	1.00
2007	Oregon	Thornhollow	2A,2B	0.00	1.00	0.00	0.00	0.00	1.00
		Direct release	3A,3B	0.00	1.00	0.00	0.00	0.00	1.00
2008	Oregon	Direct release	1A,1B,2A,2B	0.00	1.00	0.00	0.00	0.00	1.00
2009	Oregon	Direct release	1A,1B,2A,2B	0.00	1.00	0.00	0.00	0.00	1.00
2010	Oregon	Direct release	1A,1B,2A,2B	0.06	0.94	0.00	0.00	0.00	1.00
2011	Oregon	Direct release	1A,1B,2A,2B	0.00	1.00	0.00	0.00	0.00	1.00
2012	Oregon	Direct release	1A,1B,2A,2B	0.00	1.00	0.00	0.00	0.00	1.00

Appendix Table 12. Rearing conditions for yearling fall Chinook salmon reared in raceways at Bonneville Fish Hatchery, 1998-2011 broods.

Brood year	Raceway	Transfer month	Maximum density (lb/ft^3)	Maximum loading (lb/gal/min)	Number reared per gpm
1998	A6-A11	February	0.82	5.6	71
	A1-A5	March	0.89	6.1	68
1999	A7-A11	February	0.81	5.6	65
	A2-A6	March	0.96	6.6	68
2000	A7-A11	February	1.08	7.4	74
	A2-A6	March	1.13	7.7	77
2001	D8-D12, A2	February	0.82	5.6	71
	A2-A6	March	0.89	6.1	68
2002	A6-A10	February	0.90	6.2	73
	A2-A6	March	1.05	7.2	84
2003	A6-A10	February	0.98	6.7	76
	A2-A10	March	1.16	7.9	88
2004	A7-A11	February	1.07	7.4	77
	A2-A6	March	1.10	7.6	84
2005	A7-A10	February	0.82	5.6	73
	A3-A6	March	0.80	5.5	70
2006	A2-A7	February	0.62	4.6	66
	A8-A11	February	0.90	6.6	92
2007	A7-A10	February	1.35	10.0	92
	A2-A6	February	1.00	7.4	70
2008	A7, C1-C4, A13-A15	February	0.44	3.3	35
	A2-A6	February	1.49	11.0	116
2009	A2, A4, P4, P5, P7	February	0.83	6.1	81
	A7-A10, P11	February	0.64	4.7	60
2010	A9-A11	February	1.39	10.2	133
	A6-A7	February	0.80	3.9	70
	A5	February	0.42	3.1	78
	A4	February	0.27	2.0	72
	A3	February	0.67	4.9	73
2011	A9-A11	February	1.17	8.6	115
	A6-A7	February	0.65	4.8	69
	A5	February	0.44	3.2	78
	A4	February	0.30	2.2	79
	A3	February	0.15	1.1	57

Appendix Table 13. Mean length, weight, and condition factor for yearling fall Chinook salmon, brood years 1998-2011 reared at Bonneville Fish Hatchery and transferred to Thornhollow Acclimation facility in the Umatilla River.

Brood year	Acclimation Site	Transfer month	Length (mm)	Weight (g)	Condition factor
1998	Thornhollow	2/15/00	148.8	39.2	1.18
		3/13/00	150.4	40.5	1.19
1999	Thornhollow	2/13/01	147.3	37.6	1.18
		3/20/01	154.6	43.8	1.20
2000	Thornhollow	2/14/02	156.7	43.3	1.16
		3/18/02	157.0	42.4	1.11
2001	Thornhollow	1/30/03	148.0	40.0	1.21
		3/18/03	152.6	41.9	1.14
2002	Thornhollow	2/11/04	152.7	38.1	1.11
2003	Thornhollow	2/14/05	149.9	39.8	1.16
		3/7/05	155.0	43.3	1.16
2004	Thornhollow	2/14/06	152.8	41.3	1.16
		3/17/06	155.7	42.7	1.11
2005	Thornhollow	2/14/07	142.9	32.8	1.10
		3/22/07	155.6	37.3	1.02
2006	Thornhollow	3/11/08	146.0	34.2	1.06
	Pendleton	3/11/08	144.3	32.6	1.08
2007	Thornhollow	3/10/09a	160.8	49.3	1.11
	Pendleton	3/10/09a	160.5	47.8	1.11
2008	Thornhollow	3/10/10a	161.7	45.6	1.12
	Pendleton	3/10/10a	162.5	48.6	1.10
2009	Pendleton (Conserv.)	3/3/11a	145.6	34.8	1.06
	Pendleton (Harvest)	3/3/11a	154.5	40.6	1.07
2010	Pendleton (Conserv.)	3/8/12a	151.4	40.6	1.12
	Pendleton (Harvest)	3/8/12a	136.5	32.6	1.13
2011	Pendleton (Conserv.)	3/6/13a	150.5	37.4	1.11
	Pendleton (Harvest)	3/6/13a	137.6	28.0	1.11

Appendix Table 14. Smoltification proportions and proportion of descaled, partially descaled, and undamaged scaling of yearling fall Chinook salmon at transfer from Bonneville Fish Hatchery, brood years 1998-2011.

Brood Year	Acclimation Site	Date	Smolting			Descaling		
			Smolt	Intermediate	Parr	Descaled	Partial	None
1998	Thornhollow	2/15/00	0.11	0.89	0.00	0.00	0.23	0.77
		3/13/00	0.18	0.82	0.00	0.09	0.29	0.61
1999	Thornhollow	2/13/01	0.01	0.99	0.00	0.08	0.40	0.52
		3/20/01	0.00	1.00	0.00	0.00	0.18	0.82
2000	Thornhollow	2/12/02	0.98	0.02	0.00	0.02	0.02	0.96
		3/13/02	0.80	0.20	0.00	0.01	0.02	0.97
2001	Thornhollow	1/30/03	0.00	1.00	0.00	0.00	0.02	0.98
		3/18/03	0.00	1.00	0.00	0.02	0.00	0.98
2002	Thornhollow	2/11/04	0.00	1.00	0.00	0.00	0.00	1.00
2003	Thornhollow	2/14/05	0.00	1.00	0.00	0.00	0.00	1.00
		3/7/05	0.00	1.00	0.00	0.00	0.00	1.00
2004	Thornhollow	2/14/06	0.00	1.00	0.00	0.00	0.00	1.00
		3/17/06	0.94	0.06	0.00	0.00	0.00	1.00
2005	Thornhollow	2/14/07	0.00	1.00	0.00	0.00	0.03	0.97
		3/22/07	0.00	1.00	0.00	0.00	0.00	1.00
2006	Thornhollow	3/11/08	0.00	1.00	0.00	0.00	0.00	1.00
	Pendleton	3/11/08	0.00	1.00	0.00	0.00	0.00	1.00
2007	Thornhollow	3/11/09	0.90	0.10	<.01	0.00	0.02	0.98
	Pendleton	3/10/09	0.91	0.09	0.00	0.00	0.00	1.00
2008	Thornhollow	3/17/10	0.13	0.84	0.03	0.00	0.00	1.00
	Pendleton	3/10/10	0.08	0.92	0.00	0.00	0.00	1.00
2009	Pendleton	3/11/11	0.85	0.09	0.06	0.03	0.01	0.96
2010	Pendleton	3/8/12	0.15	0.85	<.01	0.00	0.00	1.00
2011	Pendleton	3/6/13	0.94	0.06	<.01	<.01	0.00	>.99