APPROVED

HATCHERY AND GENETIC MANAGEMENT PLAN (HGMP)

Hatchery Program:	Umatilla Spring Chinook Program
Species or Hatchery Stock:	Spring Chinook, Umatilla/Carson Stock 091
Agency/Operator:	Oregon Department of Fish and Wildlife/ Confederated Tribes of the Umatilla Indian Reservation
Watershed and Region:	Umatilla / Columbia / Oregon
Draft Submitted: Re-submitted for ESA Consultation/Approval:	February 24, 2006 July 7, 2010; Approval Date: 04/20/2011
Date Last Updated:	July 2010

SECTION 1. GENERAL PROGRAM DESCRIPTION

1.1) Name of hatchery or program.

Umatilla River Spring Chinook Program.

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

Spring Chinook (*Oncorhynchus tshawytscha)* Carson stock (stock 091); non-listed.

1.3) Responsible organization and individuals.

Name (and title): Scott Patterson, Fish Propagation Program Manager
Agency or Tribe: Oregon Department of Fish & Wildlife
Address: 3406 Cherry Avenue NE, Salem, OR 97303
Telephone: 503-947-6218
Fax: 503-947-6202
Email: Scott.D.Patterson@state.or.us

Name (and title): Gary James, Fisheries Program Manager
Agency or Tribe: Confederated Tribes of the Umatilla Indian Reservation
Address: P.O. Box 638, Pendleton, OR 97801
Telephone: 541-276-4109
Fax: 541-276-4348
Email: garyjames@ctuir.com

Name (and title): Bill Duke, District Fish Biologist
Agency or Tribe: Oregon Department of Fish & Wildlife
Address: 73471 Mytinger Lane, Pendleton, OR 97801
Telephone: 541-276-2344
Fax: 541-276-4414
Email: William.B.Duke@state.or.us

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 – Provides funding for acclimation, adult collection, passage, hatchery, habitat, and monitoring and evaluation activities.

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

Umatilla Hatchery 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.

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

Three Mile Falls Dam -Spring 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 can not be met at Three Mile Falls Dam, other locations where Carson stock is available, such as Little White Salmon or Carson NFH, may be used for broodstock collection or to supply eggs.

South Fork Walla Walla Adult Holding and Spawning Facility - Spring Chinook broodstock are transferred from Three Mile Falls Dam to the South Fork Walla Walla facility for holding and spawning. The facility is located at approximately RM 7 on the South Fork of the Walla Walla River, east of Milton-Freewater in Umatilla County, Oregon.

Umatilla Hatchery - Fertilized eggs are transferred from Walla Walla to Umatilla Hatchery for incubation and rearing. Umatilla Hatchery 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.

Imeques C-mem-ini-kem-- A total of 660,000 juvenile spring Chinook are transferred in two batches from Umatilla Hatchery to Imeques-C-mem-ini-kem for acclimation and release (210,000 for December release and 450,000 for April release). The facility is located on the Umatilla River at RM 79.5 in Umatilla County, Oregon.

Meacham Creek- The conservation group of 150,000 yearling smolts will be transferred from Umatilla Hatchery for direct release into Meacham Creek near Corporation at RM 89.5.

1.6) Type of program.

The Umatilla River spring Chinook program is an integrated harvest program. A "stepping stone" program is being initiated with the 2009 brood in which two groups of fish will be propagated; one which focuses on meeting harvest

objectives and one which focuses on meeting conservation objectives.

The size of the Umatilla spring Chinook program has essentially remained the same for the last decade. There have been multiple changes in rearing facilities during that time. First, releases from Carson NFH were discontinued with that production being moved to Umatilla Hatchery. Releases from Little White Salmon NFH were reduced in 2005 with production also being shifted to Umatilla Hatchery and finally Little White Salmon NFH releases were totally discontinued this year and that production was also shifted to Umatilla Hatchery. This required a change in release timing with the fall shipment for acclimation and December releases being incorporated into the program. During basin reviews of Umatilla production programs by both ISRP and HSRG, recommendations were made for changes to the program in order to more effectively meet basin natural production and harvest goals. The proposed modifications to the program are a response to these recommendations. The only changes from those listed in Table B1 of the recent *U.S. v. Oregon* Agreement are in the marking rates and the "Primary Purpose" designation.

1.7) Purpose (Goal) of program.

The Basin Summary identified an adult return goal of 8,000 spring Chinook returning to the mouth of the Umatilla River. Of the 8,000, about 6,000 were anticipated to be hatchery fish and 2,000 were expected to be natural origin adults. Disposition of these 8,000 adults was outlined in the Basin Summary as follows; 3,000 for natural spawning escapement (producing 2,000 actual spawners), 1,000 for broodstock (propagation), and 4,000 for harvest. Actual broodstock needs are 560 adults with the 440 balance allocated to harvest. In addition, further assessment of the quality and quantity of available habitat has determined that under current habitat conditions fewer spawners can be supported than identified under the long term goals. Natural spawning potential has not been determined.

1.8) Justification for the program.

The indigenous Umatilla River spring Chinook were extirpated from the Umatilla River in the mid-1900's. Now that spring Chinook have been reestablished in the basin using hatchery program, and the program is needed to meet harvest and natural spawning supplementation goals.

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 810,000 CHS smolts into the Umatilla River.	Monitor releases to insure numbers fall within IHOT guidelines ± 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 or with wire.	Adults enumerated at Three Mile Falls Dam, collected for broodstock, harvested, or recovered as carcasses are checked for 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.
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 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 transfer.
Minimize impacts to ESA listed and other native species from juvenile hatchery releases.	Smolts will be released and fish will be acclimated.	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 captured in other basins.	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.	Creel 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 spring Chinook yearling production goal is 810,000 smolts. All production occurs at Umatilla Hatchery.

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

Broodstock needs are 560 adults and 28 jacks comprised of 456 adults (228 pair) and 22 jacks of hatchery origin and 104 adults (52 pair) and 6 jacks of natural origin.

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

Life Stage	Release Location	Annual Release Level
Eyed Eggs	Meacham Creek	50,000*
Unfed Fry		
Fry		
Fingerling		
Yearling	Imeques C-mem-ini-kem RM 79.5 Umatilla River	660,000 smolts
Yearling	Direct release in Meacham Creek near Corporation, RM 89.5	150,000 smolts

*Note: Outlet location and placeholder for surplus eggs.

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 goal is 0.75%. Five hatcheries have been used at varying times to rear yearling smolts for release in the Umatilla River. These included Bonneville Hatchery (BY 1986-1993), Carson Hatchery (BY 1990-1999), Little White Salmon Hatchery (BY 1996-2004), Willard Hatchery (BY 2000 and 2005), and Umatilla Hatchery (BY 1991-present). The 12 years' average smolt-to-adult survival for yearlings reared at Umatilla Hatchery ranged from >0.1-1.1% and averaged 0.47% (Appendix Table 1, Clarke et al. 2009). The overall average smolt-to-adult survival for yearlings reared at all other hatcheries ranged from 0.0-1.3% and averaged 0.37% (Appendix Table 1, Clarke et al. 2009).
- Adult production: Subbasin Summary goal is 6,000 hatchery and 2,000 natural adult returns to the Umatilla River. Since run year 1988, hatchery adult returns have ranged from 13 to 5,436 and averaged 2,999 (Appendix

Table 2, Clarke et al. 2009). Since 1996, naturally-produced adult returns ranged from 22 to 380 and averaged 198 (Appendix Table 2, Clarke et al. 2009).

- Non-endemic hatchery spring Chinook enumerated at TMFD from run years 1993 to 2007 comprised an average of 0.28% of hatchery returns and 0.26% of combined hatchery and natural returns (Appendix Figure 1, Clarke et al. 2009). The most prevalent non-endemics originated from hatchery smolt releases in the Tucannon and Grande Ronde river basins, and from Ringold Hatchery.

- Adult escapement to natural production areas: Since run year 1996, hatchery adult escapement to natural production areas has ranged from 143 to 3,472 and averaged 1,848 (Appendix Table 3, Umatilla Hatchery M&E Project database).

- Harvest in the Umatilla Basin: Since 2000, non-tribal harvest has averaged 435 fish with a high of 724 in 2002 and a low of 119 in 2008; Tribal harvest has averaged 462 fish with a high of 695 in 2000 and a low of 203 in 2005 (Appendix Tables 4&5; notable that additional CWT reporting may increase harvest estimates).

- Harvest (Tribal and non-Tribal) in the Columbia River and Columbia River tributaries has averaged 505 fish since 2000 with a high of 1,357 in 2002 and low of 267 in 2007 (Appendix Table 6; note: additional CWT reporting may increase harvest estimates).

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

The first releases of spring Chinook in the Umatilla River were made in 1986 with the first releases from Umatilla Hatchery made in 1992 (Appendix Table 1).

1.14) Expected duration of program.

The program is ongoing.

1.15) Watersheds targeted by program.

Umatilla River subbasin.

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

Managers have reassessed the hatchery program and are implementing the Hatchery Scientific Review Group's (HSRG) recommendation for initiating a "stepping stone" program in the basin.

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

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

The program operates under the HGMP submitted to NOAA on February 24, 2006. This is an updated version of the previously submitted HGMP. In addition, the evaluation of juvenile steelhead outmigration and survival by ODFW in the lower Umatilla River basin is conducted under NOAA Fisheries section 10 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.

Spring Chinook adult stray rates range from 0.2% to 2.0% (Table 1) which may indirectly affect the ESA-listed populations. The majority of strays are recovered in Columbia River tributaries and the Snake River. Rearing all fish at Umatilla Hatchery is expected to reduce strays. All harvest group smolts will be acclimated and the "stepping stone" program's fish will be released high in the basin.

Table 1. Umatilla River non-harvest adult recoveries (strays) in 2000-07.

Run Year	Hatchery Adults	Non-Columbia Tributary recoveries (strays)	Columbia Tributaries and Snake River (stray)	Percent Stray
2000	3,872	7	70	2.0
2001	4,134	0	63	1.5
2002	4,882	0	78	1.6
2003	3,552	0	8	0.2
2004	2,648	2	17	0.7
2005	1,808	0	16	0.9
2006*	4,714	0	22	0.5
2007*	2,803	0	27	1.0
*May adjust higher when CWT are recovered and analyzed.				

Umatilla River Summer Steelhead (*Oncorhynchus mykiss*; stock 091) are a part of the Mid-Columbia ESU and 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, 1987-2008[1].

Year	# Hatchery Fish	# Wild Fish	Total	% Hatchery Fish	% Wild Fish
1987-88	165	2315	2480	7	93
1988-89	370	2104	2474	15	85
1989-90	245	1422	1667	15	85
1990-91	387	724	1111	35	65
1991-92	523	2246	2769	19	81
1992-93	616	1297	1913	32	68
1993-94	345	945	1290	27	73
1994-95	657	874	1531	43	57
1995-96	785	1296	2081	38	62
1996-97	1463	1014	2477	59	41
1997-98	903	862	1765	51	49
1998-99	750	1135	1885	40	60
1999-00	752	2140	2892	26	74
2000-01	1091	2571	3662	30	70
2001-02	1895	3621	5516	34	66
2002-03	963	2117	3080	31	69
2003-04	1287	2101	3388	38	62
2004-05	756	1722	2478	31	69
2005-06	488	1480	1968	25	75
2006-07	914	2566	3480	26	74
2007-08	901	2232	3133	29	71
Average	**774**	**1752**	**2526**	**31%**	**69%**

[1]Source: Clarke et al. 2009

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 naturally-produced adult summer steelhead returning to TMFD spent two years in freshwater before outmigration (Figure 1). Nearly equal numbers of total 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 2).

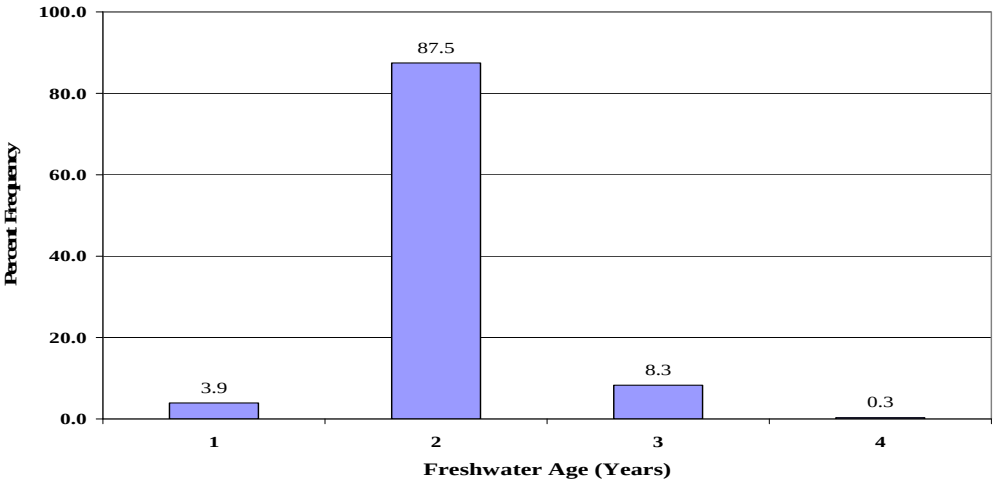


Figure 1. Years of Freshwater Rearing of Natural Summer Steelhead Adults Returning to the Umatilla River, 1983, 1989, 1990, 1992, and 1994-2004, 2006, 2007 (n = 918)

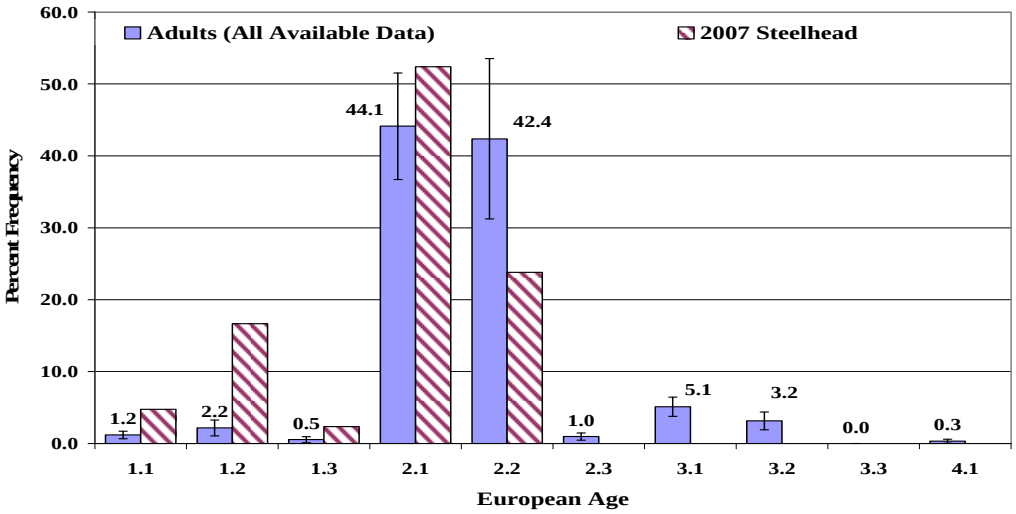


Figure 2. Combined European Age (years of freshwater and salt water rearing) of Natural Summer Steelhead Adults Returning to the Umatilla River (solid bars1983, 1989, 1990, 1992, and 1994-2004, 2006, 2007 return years, n = 918 with plus and minus one standard deviation; banded bars, 2007 data only; n = 42)

Table 3a-3c. Life History Tables of Umatilla Summer Steelhead By River Reach.

3a. From the mouth of the Umatilla River 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 Recovery Plan are a 10-year geomean 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 3 illustrates progeny-to-parent and smolts per female productivity measures for Umatilla River naturally-produced steelhead (Clarke et al. 2009, White et al. 2007). All available egg-to-smolt survival and smolt-to-adult return data for Umatilla natural steelhead are presented in Table 4 (White et al. 2007).

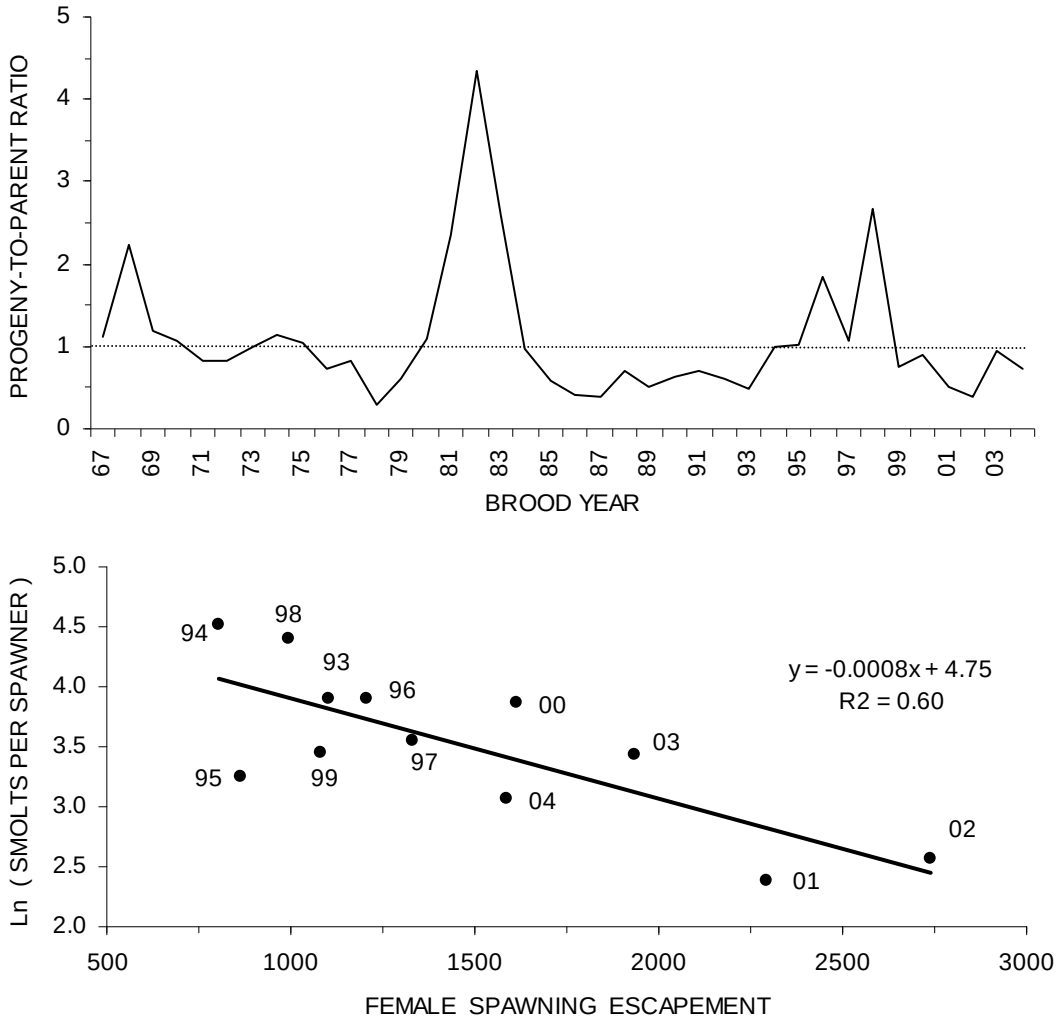


Figure 3. Progeny-to-parent ratios (top) and smolts per female spawner productivity measures for Umatilla River naturally-reared steelhead. Parents were hatchery and natural spawning escapement, progeny estimates of natural adults produced, and smolts estimated abundance of juvenile outmigrants to the lower Umatilla River.

Table 4. Egg-to-smolt survival and smolt-to-adult return (SAR) for Umatilla natural 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 and percent of adult steelhead available to spawn of wild- and hatchery-origin since 1996 are presented in Table 5.

Table 5. Disposition of summer steelhead (STS) adults returning to the Umatilla River at and above Three Mile Falls Dam, run years 1995-96 through 2007-08. Data for Run Year 2007-08 are preliminary.

RUN YEAR	1995 -96	1996 -97	1997 -98	1998 -99	1999 -00	2000 -01	2001 -02	2002 -03	2003 -04	2004 -05	2005 -06	2006 -07	**2007 -08**
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	69F2 8M	26F 23M	54F 28M	35F-27M	23F 20M	26F 14M	22F 24M	34F 49M
Natural STS Taken for Brood	52F-50M	50F-50M	40F-40M	47F-49M	44F-57M	46F4 6M	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 Available to Spawn	342	641	450	370	308	547	800	465	540	377	122	383	377
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

RUN YEAR	1995 -96	1996 -97	1997 -98	1998 -99	1999 -00	2000 -01	2001 -02	2002 -03	2003 -04	2004 -05	2005 -06	2006 -07	**2007 -08**
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	

- 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.

The percent of adults available to spawn that were of hatchery origin from brood years 1996-2008 has ranged from 22.5-58.9 and averaged 31.9% (Table 6).

Table 6. Percent of adults available for spawning in the Umatilla River that were hatchery origin, brood years 1996-2008.

Brood Year	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Percent of Spawners Hatchery Origin	34.2	58.9	49.4	35.8	22.5	26.6	32.1	28.7	35.6	27.7	16.8	22.7	24.2

2.2.3) <u>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</u>

- 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 to provide the eggs for the hatchery program, which has been described in a separate HGMP for the Umatilla summer steelhead program.

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 plans summarizing M&E activities

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 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 two 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. Table 8 presents the CWT and PIT tagging plan for hatchery monitoring and evaluation for fish released in 2010.

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 fund ODFW staff (through their ongoing M&E project) to insert PIT tags and release of 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 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 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. Past numbers of juveniles sampled and sampling mortalities, are shown in Table 6, but these activities were directly related to Umatilla River summer steelhead propagation and M&E program which has been described in a separate HGMP.

Table 6. Annual number of juvenile summer steelhead sampled, and sampling mortalities, in the Umatilla River from 1995 to 2007, mainly due to monitoring and performance evaluation of summer steelhead program.

Year	Number 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).

See Table 7 below.

Table 7. Estimated listed salmonid take levels by hatchery activity (see notes at the bottom of the Table).

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 due other hatchery and monitoring programs. **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	500*	0
Collect for transport b)	0	0	0	0
Capture, handle, and release c)	0	0	500*	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	200***	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 spring Chinook salmon adult trapping at TMFD, potentially 500 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.
*** Intentional take associated with the CTUIR's project on the development of salmon progeny marker.

- 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 the 4d rule research application, 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 escape 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.1 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.

This program incorporates many of the HSRG recommendations for a steeping stone approach to supplementation. The removal of hatchery returning adults at TMFD was not incorporated as it would eliminate Tribal and non-tribal tributary fisheries.

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, 37 pages;
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 and is expected to be consistent with the Mid-C draft steelhead recovery plan.

3.3) Relationship to harvest objectives.

State and tribal co-managers, as part of the Umatilla Hatchery Master Plan, developed spring Chinook harvest guidelines. These guidelines were designed to support the rebuilding of the spring Chinook run. Changes to the harvest guidelines will be implemented once returns from the "stepping stone" production program are realized. The spring Chinook program also contributes to ocean and Columbia River fisheries.

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

Spring Chinook fisheries have occurred in the Umatilla River in fifteen of the past nineteen years and consecutively the past ten years. Annual harvest and participation in the non-tribal fishery increased substantially after the river below TMFD was first opened in 2000 (Appendix Tables 4). Since 2000, annual harvest has ranged from 119 to 749 fish and averaged 435. Since 2000, Tribal harvest has ranged from 203 to 639 and averaged 431 fish (Appendix Table 5).

Spring Chinook salmon produced by the Umatilla Hatchery Program contribute to out-of-basin tribal and non-tribal fisheries (Appendix Table 6). From 1990-2007, almost all out-of-basin harvest was in the Columbia River (97%), and only 2% in the ocean, and 1% in mid-Columbia tributaries. Total numbers harvested ranged from 4 -1,357 and averaged 283 fish per year (Appendix Table 5). Average out-of-basin harvest increased five-fold during 2000-2007 (505 fish) compared to 1990-1999 (105 fish).

3.4) Relationship to habitat protection and recovery strategies.

The Umatilla spring Chinook program is a part of the overall Umatilla Basin Salmon and Steelhead Restoration Plan. 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 spring 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.

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 and naturalized spring Chinook juveniles 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 straying into the Tucannon River. In order to minimize the potential for these effects to occur, program fish are primarily released as smolts and are acclimated and released in the upper basin. The interactions of smolts released in December or released due to an emergency on naturalized fish is unknown. 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. Spring Chinook also play an important role in community ecology since this population historically existed sympatrically with other species in the basin.

In addition, migrating hatchery fish may overwhelm predator populations, providing a potential protective effect to natural steelhead in the migration corridor. Off spring from natural spawning of program fish may also provide a forage source for both bull trout and natural steelhead smolts.

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, 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.

Three Mile Falls Dam - The water source for the Three Mile Falls Dam adult facility is pumped directly from the Umatilla River. The Denil steep-pass utilizes 2,900 gpm and the holding pond uses 1,450 gpm. Both the steep-pass 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). Water temperatures at Three Mile Falls Dam range from approximately 0°C (32°F) in winter to over 21°C (70°F) during the summer. Sediment loads vary dramatically and large sediment loads are experienced annually during high flow conditions. The water source is the same as used by the natural population.

Imeques C-mem-ini-kem Acclimation Facility - Imeques is fed by gravity flow directly from the Umatilla River. Flows are held constant at approximately 1,600 gpm per each of four acclimation ponds. During the juvenile acclimation period (mid-November to mid-April), average monthly temperatures range from approximately 0.0 to 10.0 C (32.0 to 50.0^{o} F).

South Fork Walla Walla Adult Holding and Spawning Facility - The facility has a gravity diversion from the South Fork Walla Walla River. Water then flows to the intake system which has an automatic screen cleaner and pump station with a capacity of 8,700 gpm.

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.

Imeques C-mem-ini-kem Acclimation Facility - Facility intake screens conform to NMFS screening guidelines to minimize the risk of entrainment of juvenile listed fish.
South Fork Walla Walla Adult Holding and Spawning 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 jumpout 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 then 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.

Broodstock are transported in either a 3,000 or 3,500 gallon fish transportation unit. The tankers are equipped with both liquid and compressed oxygen aeration with re-circulation systems and have 12" discharge outlets. The 3,000 gallon unit has two compartments that allow for two groups to be segregated in one load.

5.3) Broodstock holding and spawning facilities.

South Fork Walla Walla Adult Holding and Spawning Facility – Broodstock are transported from Three Mile Falls Dam to the South Fork facility for holding and spawning. The facility includes a water intake system with automatic screen cleaning, pump station having a nominal pumping capacity of 8,700 gpm, ozone effluent water treatment system, settling pond, five adult holding ponds (each 90' x 10' x 5' with effective water volume = 4,500 ft^3), mechanical fish crowder, standby generator, chemical storage and spawning buildings and two homes for night watch personnel. 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 and office space.

5.4) Incubation facilities.

Umatilla Hatchery - Fertilized eggs are transported from South Fork Walla Walla to Umatilla Hatchery 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^{o}C (54^{o}F) or mixed with chilled water 7.2^{o}C (45^o F) for any combination of temperatures from 7.2-12.2^{o}C (45-54^o F) provided that 300 gpm of chilled water is not exceeded. The fourth unit can be mixed with water chilled to 3.3^{o}C (38^o F) to achieve any combination of temperatures from 3.3-12.2^{o}C (38–54^o F) provided that 60 gpm of chilled water is not exceeded.

Numerous systems continually monitor temperature, mechanical systems, electrical systems, and flow. Alarms sound if any system fails or is out of criteria. Continual monitoring of systems and preventative maintenance is used to 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 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.

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. Spring Chinook are started in these tanks in mid-May. The fish are moved outside to an Oregon pond when densities reach approximately 80 pounds in each tank.

Umatilla Hatchery has 10 Oregon style ponds. Rearing dimensions are 91' X 18.75' X 3.67'. These ponds are designed for serial reuse in groups of 2 ponds, upper and lower. They also can be supplied with fresh water individually, if necessary. Spring Chinook are reared in the Oregon ponds until fish are marked in early August and then moved to Michigan ponds.

Umatilla Hatchery has 24 Michigan style ponds, with rearing dimensions of 91' X 9' X 2.75' (same comment). Water is supplied to these ponds in reuse 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. Chinook are reared at enhanced densities to utilize available well water efficiently. In November, 360K fish are transferred to Imeques for acclimation. The remainder is transferred to Imeques in mid-January, and all are released by mid-April.

All ponds have a high-low water level alarm, and for Michigan ponds, 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, and forecasting for contingencies, are the best means for dealing with the possibility of rearing pond system failure. Monitoring and maintenance of the water supply system occurs on a regular basis.

Pathogen free water is used for rearing all programs at Umatilla Hatchery. This is a direct preventive measure for minimizing the risk of introducing pathogens into hatchery phase of this 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 juveniles reared at Umatilla Hatchery.

5.6) Acclimation/release facilities.

Imeques C-mem-ini-kem Acclimation Facility - The Imeques acclimation/release facility includes a water intake structure with automatic screen cleaner, water head box/distribution system, storage building, four acclimation ponds (approximately 13,000 cubic feet each) and water outlet and fish release structure. Water is supplied by gravity flow (approximately 1,600 gpm per pond). The ponds are covered with netting to prevent bird predation. In case of power 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, fish are also released in this manner. ODFW pathology personnel are available to address disease concerns.

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

Umatilla Hatchery - There have been no operational difficulties or disasters at the facility that have led to significant fish mortality.

Imeques C-mem-ini-kem Acclimation Facility – Extreme cold weather and icing of the intake and acclimation ponds occurs on an annual basis. In certain years, fish have to be released early due to loss of a majority of the water at the facility because the intake becomes frozen. During this type of situation, fish are obviously being released in adverse conditions but no significant mortalities have been observed.

South Fork Walla Walla Adult Holding and Spawning Facility – There have been no operational difficulties or disasters at the facility that have led to significant fish mortality. Power spikes and failures are common at his facility; however, the backup systems have worked according to design and as stated, no fish have been lost.

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 - fish being propagated are non-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.

Since 2000, only Carson stock spring Chinook from the Umatilla River have been used for the program.

6.2) Supporting information.

6.2.1) History.

From brood years 1984 to 1999, Carson stock spring Chinook broodstock from various sources (Carson NFH, Lookingglass Hatchery, Big Canyon Hatchery, Ringold Hatchery, Little White Salmon NFH, and adult returns to the Umatilla River) were used for the Umatilla River program. Since 2000, however, all spring Chinook broodstock have been collected from the Umatilla River.

6.2.2) Annual size.

The number of spring Chinook broodstock collected for holding/spawning since 2000, when all broodstock have been collected from Umatilla River adult returns, has varied from 585 in 2007 to 630 in 2001 (Table 9). The current collection goal is for 560 adults and 28 jacks. The collection goal in following years is anticipated to be similar.

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

Historically, there was no goal established for natural fish in the broodstock. Natural fish were included randomly as part of the general population during collections from Three Mile Falls Dam.

However, a "stepping stone" program is being initiated with the 2009 brood in which two groups of fish will be propagated; one group will focus on meeting harvest objectives and the other group on meeting conservation objectives. For the harvest group, the brood goal is 456 adults (228 pair) and 22 jacks, all of hatchery origin. For the conservation group, the goal is 104 adults (52 pair) and six jacks, all of natural origin.

6.2.4) Genetic or ecological differences.

Carson stock spring Chinook from various sources has been the only stock used for the Umatilla program. Broodstock has consisted of both marked and unmarked fish and there is likely no difference between the hatchery and natural

populations.

6.2.5) Reasons for choosing.

Carson stock was selected for reestablishment of spring Chinook salmon in the Umatilla River due to its widespread availability and the lack of a suitable donor source from adjacent watersheds.

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.

Spring Chinook existed sympatrically with steelhead in the Umatilla Basin. It is unlikely that broodstock selection practices for spring 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 and jacks.

7.2) Collection or sampling design.

All brood are collected at the Three Mile Falls Dam's east bank adult trapping facility from late April through mid June. Beginning in December and continuing through the spring, adults returning to Three Mile Falls Dam are trapped for five days and allowed to volitionally migrate for nine days. Brood is collected during the five day trapping periods. 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 and jacks are collected at a 1:10 ratio to adult males.

7.3) Identity.

Only one population of spring Chinook is present in the Umatilla River. Naturally-produced fish are unmarked while all hatchery-produced fish are either Ad-clipped and/or contain CWT. A detector is used at Three Mile Falls Dam to check unmarked fish for the presence of CWT.

7.4) Proposed number to be collected:

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

The broodstock goal is 560 adults and 28 jacks, comprised of 456 adults (228

pair) and 22 jacks of hatchery origin and 104 adults (52 pair) and 6 jacks of natural origin.

7.4.2) Broodstock collection levels for the last twelve years (e.g. 1988-99), or for most recent years available:

Table 8. Number of spring Chinook broodstock and egg collection and juvenile survival, 1997-2008.

Year	Adults			Eggs	Juveniles
	Females	Males	Jacks		
1997	321	276	0	1,029,237	671,683
1998	111	83	8	455,953	Unknown
1999	327	274	30	942,988	689,265
2000	320	286	13	1,120,995	878,971
2001	365	235	30	1,175,281	787,373
2002	322	238	26	1,017,113	869,466
2003	253	306	27	1,051,246	791,492
2004	307	257	26	1,148,349	804,853
2005	316	246	28	1,040,529	892,087
2006	291	272	26	968,200	837,637
2007	286	272	27	1,071,664	807,178
2008	362	202	22	1,108,632	

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 or the Walla Walla outplanting program are released upstream. These fish are available for both harvest and natural production.

7.6) Fish transportation and holding methods.

Umatilla spring Chinook broodstock are collected at the Three Mile Falls Dam adult collection facility and transported to the South Fork Walla Walla Adult Holding and Spawning Facility. Transit time is approximately two hours. Fish are hauled as per ODFW's fish hauling and liberation protocols. Water temperatures are monitored in the tank and at the facility to ensure there is minimal water temperature difference between transport tanks and adult holding tanks.

For logistical reasons, the two production groups of broodstock (harvest and conservation) will be transported and initially held together. During the reinjection process the two groups will be segregated based on marks with the harvest group fish all being ad-clipped and the conservation group fish being unmarked.

Adults are held in concrete ponds. There are five ponds at the facility, each pond is 90' x 10' x 5' with an effective water volume of 4,500 ft^3. Holding densities range from approximately 14.3 to 15.4 cubic feet per adult and flow rates vary from approximately 2.5 to 2.7 gpm per adult. The broodstock goal for 2009 is 560 adults and 28 jacks. With logistical considerations for holding two separate groups will result in a maximum density of approximately 9.4 cubic feet per adult and flow rate of 1.7 gpm per adult. Mortality of adults held at South Fork Walla Walla has ranged from 2.0 to 8.5% and has averaged 4.5% since 2000 (Table 9). Pre-spawn mortality is built into the broodstock collection goals.

Table 9. Spring Chinook broodstock pre-spawn mortality from 2000 to 2009.

Run Year	Adult Brood	Mortality	Percent Mortality
2000	619	35	5.7
2001	630	15	2.4
2002	586	18	3.1
2003	586	50	8.5
2004	590	22	3.7
2005	590	38	6.4
2006	589	27	4.6
2007	585	34	5.8
2008	586	12	2.0
2009	591	19	3.2
10-year totals	5,952	270	4.5

7.7) Describe fish health maintenance and sanitation procedures applied.

Three Mile Falls Dam - Adults retained for broodstock are injected with oxytetracycline (10 mg/kg) and erythromycin (20 mg/kg).

South Fork Walla Walla Adult Holding and Spawning Facility – Broodstock are reinjected in July with oxytetracycline (10 mg/kg) and erythromycin (20 mg/Kg). To control fungal infections formalin treatments are given at a maximum concentration of 167 ppm. The treatment is applied for one hour to control fungus and parasites three times per week.

7.8) Disposition of carcasses.

All spring 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.

Umatilla Basin
Spring Chinook existed sympatrically with steelhead in the Umatilla Basin. During spring Chinook brood collection at Three Mile Falls Dam if any listed steelhead is captured will be released unharmed with minimal handling stress or be taken as brood fish for steelhead propagation program, which has been described in a separate HGMP.

Walla Walla Basin
Spring Chinook formerly existed sympatrically with steelhead in the Walla Walla Basin. The likelihood of disease transmission from spring Chinook brood to endemic steelhead in the Walla Walla should be minimal, considering the prophylactic treatments (oxytetracycline and erythromycin) applied to adults held at the South Fork facility.

SECTION 8. MATING

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

8.1) Selection method.

From mid August to mid-September, broodstock maturation status are checked and sorted regularly once a week. Beginning with the 2009 brood, two groups of broodstocks (harvest and conservation) will be held. All ripe females from each group will be spawned on a given spawn day until the egg goals are met. Enough ripe males (including jacks) from each group will be randomly selected on a given spawn day to fertilize the available females from that group. Fish are anesthetized with CO_2 during selection for spawning.

8.2) Males.

Males (including jacks) are used at a proposed rate of one ripe male for every ripe female and are randomly selected from their respective broodstock population. Whenever possible, one male is used to fertilize the eggs from one female. 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 within each production group. 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 then 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 South Fork, and 3) annual fish health monitoring of Umatilla spring 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 Spring 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 spring Chinook program have any impact on listed steelhead.

SECTION 9. INCUBATION AND REARING

9.1) Incubation:

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

The goal for the program is to collect 1.08 million green eggs to produce 810,000 smolts (a green egg to smolt survival rate of 75%). See Appendix Table 9 for historical information of egg survival rates.

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

The Umatilla Spring 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--Hatchery incubation consists of 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.

9.1.4) Incubation conditions.

Umatilla Hatchery - Oxygen saturation levels average 10 ppm influent and 9 ppm effluent. Water flows are regulated to a minimum of 4 gpm, with individual egg take temperatures ranging from 38^0F to 54^0F.

9.1.5) Egg Transfers.

No eggs are transferred to other hatcheries for the program.

9.1.5) Ponding.

Umatilla Hatchery - Spring Chinook are ponded mid-May at 1,850 temperature units and at approximately 1,375 fish to the pound, and 100% button-up.

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 in the incubators with formalin treatments at a concentration of 1667 ppm (1:600). Treatments are scheduled seven times per week for 15 minutes. Little mortality has been attributed to yolk-sac malformation. After eyeing, dead eggs are hand picked.

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 spring Chinook incubation at Umatilla Hatchery will have any adverse genetic impact on listed steelhead. 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.

See Appendix Table 9 for historical information of survival rates.

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

Umatilla Hatchery--Current production goals are to have a final density of 5 lbs/ft^3 and loading rate of 12 lbs/gpm, with a 3.4 raceway volume exchange per hour.

9.2.3) Fish rearing conditions.

Umatilla Hatchery - The final rearing of program fish is exclusively in Michigan style ponds at Umatilla Hatchery (Refer to section 5.5). Fish are fed at least once every hour by mechanical feeder. Ponds are self-cleaning, with the assistance of baffles and high water exchange rates. All waste is settled out behind the lower pond screens and is pumped to hatchery settling ponds up to three times per week. Mortalities are removed once per day. Dissolved oxygen is monitored weekly or as needed, as well as oxygen delivery systems and oxygen delivery rates. Water flow rates are monitored weekly and temperatures range from 52^0F to 61^0F. Dissolved oxygen levels are maintained at or above 8.0 ppm. Ammonia and total gas saturation levels have not been a problem. All monitoring results are recorded (Appendix Table 7).

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 10. Average growth (fish/lb) of spring Chinook at Umatilla Hatchery (brood year 2002).

Fish/lb	Month	Conversion
474	May	1.0
245	June	1.1
125	July	1.2
70	August	1.5
45	September	1.3
27	October	1.3
19	November	1.3
14	December	1.25
13.7	January	1.4

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

See Table 10 for monthly fish growth (#fish/lb) and food conversion ratios for brood year 2002. Also see section 9.2.6 below for food conversion efficiency. Energy reserve data are not 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 - Spring Chinook are fed Bio-vita starter, Bio-vita grower, and Bio-Clark feed. Fish are fed every half hour up to 34 times per day, by mechanical feeders at rates of approximately 1.8%-6.0% body weight. The total food conversion efficiency for this program was 0.93 pounds of feed fed per pound of fish weight gained (2007 brood).

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

Umatilla Hatchery-- Monthly fish health monitoring follows specific protocols as described in the Umatilla Fish Health Monitoring and Evaluation Plan. 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 ELISA. One erythromycin therapeutic feed treatment for BKD is scheduled at Umatilla. The target dose is 100 mg erythromycin per kilogram fish.

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

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

Sanitation Procedures – ODFW's Fish Health Management Policy provides guidelines for preventative and therapeutic fish health strategies that will be followed in this program.

Table 11. Disease history (2004-2008) of Umatilla River spring Chinook adults spawned at South Fork Walla Walla adult facility and juveniles reared at Umatilla Hatchery[a].

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

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

Umatilla Hatchery – A subjective smolt development assessment is collected prior to transfer to the acclimation facility (Appendix Table 12). No gill ATPase activities are measured.

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

None are used in the program.

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

SECTION 10. RELEASE

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

10.1) Proposed fish release levels.

Age Class	Maximum Number	Size (fpp)	Release Date	Location
Eggs	*50,000		Fall	Meacham Creek
Unfed Fry				
Fry				
Yearling	210,000	15	December	Acclimated releases from Imeques AF RM 80
„	450,000	15	April	Acclimated releases from Imeques, RM 80
„	150,000 (Cons.)	15	April	Direct releases at Meacham Creek near Corporation, RM 89.5

*Note: this is a placeholder for surplus. This is not a planned release and not expected to occur.

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

Stream, river, or watercourse: Umatilla River
Release point: Imeques Acclimation Facility (RM 79.5)
Major watershed: Umatilla River
Basin or Region: Mid-Columbia River

Stream, river, or watercourse: Umatilla River
Release point: Meacham Creek near Corporation (RM 89.5)
Major watershed: Umatilla River
Basin or Region: Mid-Columbia River

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

Juvenile spring Chinook have been released in the Umatilla River basin since 1986. Release numbers have varied between 225,883 (yearling spring releases) in 1997 to 1,836,737 (yearling spring and subyearling fall and spring releases) in 1994. The current production goal is 810,000 smolts with 210,000 released in December and 450,000 released in April. Also, the conservation group (150K) will be released in April (Table 10.1). The data of past releases are shown in Table 12.

Table 12. Spring Chinook release numbers and size at lease, 1992 - 2007.

Release Year	Eggs/ Unfed Fry	Avg size	Fall Rel.	Avg size	Subyearling Spring Rel.	Avg size	Yearling	Avg size
1992			234,345	13.8	1,250,210	34.7	304,283	10.6
1993			460,809	19.9	667,367	27.6	491,816	11.5
1994			378,225	8.7	839,377	30.4	610,245	10.5
1995							673,331	11.1
1996							378,561	8.9
1997							225,883	9.1
1998			114,370	18.1			827,612	12.7
1999							659,607	14.0
2000							816,184	12.7
2001							782,733	11.4
2002							876,121	13.9
2003							782,106	13.8
2004							867,993	14.9
2005							790,039	15.5
2006							803,811	14.7
2007							890,620	15.5
Average			296,937	12.8	918,985	31.4	673,809	12.6

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

Historically, fish releases have occurred both in the spring and fall. With two exceptions, all releases from 1995 through 2006 were in the spring (March and April). Beginning in 2007, a late fall shipment for acclimation and early December release of 210,000 smolts was initiated in conjunction with rearing all production at Umatilla Hatchery. Release evaluations suggested that fish reared at Umatilla Hatchery and released in the fall or early December outperformed releases from Little White and Willard Hatchery. Not only this production change was cost effective, it is expected that it would have better adult returns as well (Appendix Table 1).

From 1986 to 1994, releases were made directly into the Umatilla River or were acclimated and force released at the end of the holding period. From 1995 to 1999, all fish were acclimated and force released. Beginning in 2000, all groups of fish have been acclimated and have been allowed to volitionally release. Currently, the late fall release group is volitionally released for one week prior to being forced out in December. The spring release groups have an extended six week volitional release period prior to being forced out in mid April.

Beginning with the 2009 brood, the conservation group is proposed to be direct stream released at Corporation (RM 89.5 - higher in the watershed) in April. The harvest groups will continue to be acclimated and released in December and April from Imeques.

10.5) Fish transportation procedures, if applicable.

Umatilla Hatchery - Chinook smolts are loaded 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 a maximum rate of 1.0 lbs/gallon. Transport time from Umatilla Hatchery to Imeques is less than two hours. Supplemental oxygen and aeration is provided and temperature is monitored during transport.

10.6) Acclimation procedures (*methods applied and length of time***).**

The proposed acclimation periods range from two weeks to five months. The fish are fed Silver Cup Slow Sinking Salmon Feed twice each day at rate of approximately 0.25 to 0.5% 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. 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 the fish.

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

Historically, spring Chinook releases have been unmarked, adipose clipped and CWT, or adipose clipped with a ventral mark and CWT. Beginning with the 2002 releases, spring Chinook have been 100% adipose clipped with adipose/ventral/CWT tag groups. Ventral clips have been alternated from right to left to designate brood year. Beginning with the 2009 brood, the harvest group will be 100% adipose clipped with representative (60K) Ad-CWT and the conservation group will be unmarked with 100% CWT.

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

Surplus fish will be identified at the earliest life history stage, typically egg. Eggs will be released in the fall after the embryos have developed a visible eye.

Occasionally, surplus fish are identified after adipose fin marking. These fish will be transferred to Imeques in the fall transfer production group and released in early winter.

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 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 (spring Chinook)
- 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.

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

Imeques C-mem-ini-kem 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.

Smolts are all acclimated and released high in the basin to minimize straying of adults. In addition, all hatchery fish released are marked with an adipose clip and/or CWT.

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.

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 spring Chinook monitoring and evaluation activities that require additional funding for implementation.

- Expand the existing Umatilla River Juvenile Outmigration and Survival Project (BPA project no. 1989-024-01), which currently samples steelhead, to include sampling for spring and fall Chinook, and Coho salmon. Estimated cost: $250,000 annually.
- Evaluate the genetic divergence resulting from implementation of the "stepping stone" program recommended by the Hatchery Scientific Review Group. The program is designed to develop a locally adapted spring Chinook salmon stock. As recommended, starting in brood year 2009 the hatchery program will rear *Harvest* and *Conservation Groups*; the *Conservation Group* will come from naturally-produced parents whereas the *Harvest Group* will come from hatchery produced parents. Tissue samples will be collected at the program's inception to establish baseline genetics, and after the second and fourth generations to measure genetic divergence between the *Harvest* and *Conservation* groups. Estimated cost to run baseline genetics samples is $10,000.
- Monitor and assess the residualization of hatchery and naturally reared

steelhead and spring Chinook salmon. Residualized steelhead and Chinook salmon will be sampled during river surveys. Residuals will be classified based on the presence of a fin clip or wire tag for hatchery fish, the length-frequency distribution for natural Chinook salmon, and using outlier analysis for the juvenile population. Resident redband trout populations will be similarly noted, but are recognized as part of the Umatilla steelhead population. Estimated costs are for two seasonal biologists employed for 3 months each: $25,600 annually.

- Hire a second creel surveyor for two months during the spring Chinook fishing season. In the past there were two creel surveyors for this fishery, but funding reductions eliminated one position. Cost: $8,500 annually.

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 affects on listed steelhead.

SECTION 12. RESEARCH

12.1) Objective or purpose.

The ongoing Umatilla River M&E program research 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.

- Richard W. Carmichael
- Lance R. Clarke
- Will A. Cameron
- R. Wes Stonecypher

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 1.9

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 7).

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" (Table 1).

See Table 7.

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.

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 (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.

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]	*Salvelinus 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 Falls 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 13) 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 13. 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 species: None

Candidate species:

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: Critical habitat for bull trout exists within the subbasin.

15.3) Analyze effects.

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

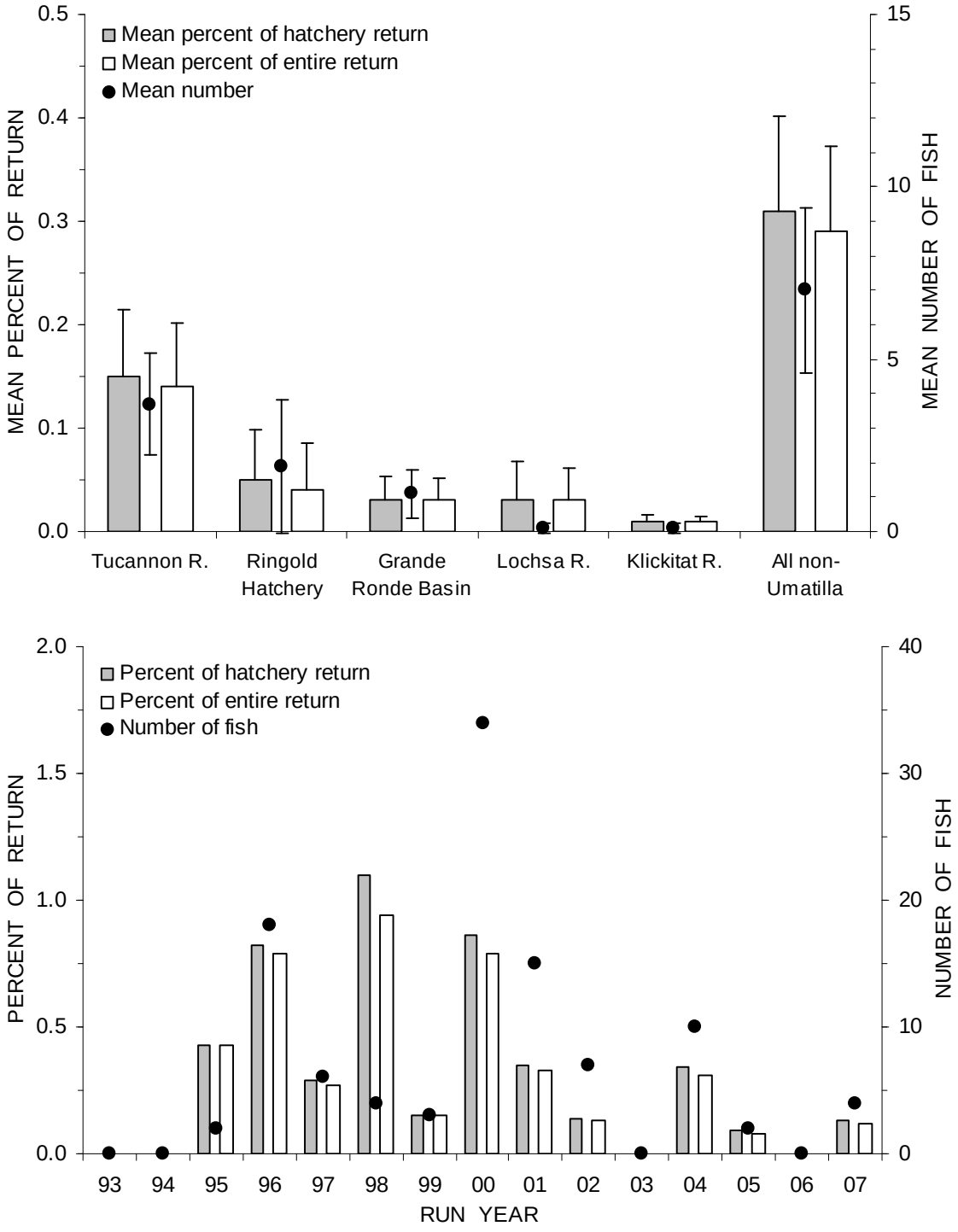
Appendix Table 1. Number of adults produced, smolt-to-adult survival, and percent of adult production that returned to the Umatilla River for yearling spring Chinook salmon reared at Bonneville (BFH), Carson (CFH), Little White Salmon (LWS), Willard (WFH), and Umatilla (UFH) fish hatcheries, brood years 1986-2002.

Brood Year	Hatchery	Size at Release (fish/lb)	No.[c] Coded-wire Tags Recovered	No. Adults Produced	Percent Smolt-to-Adult Survival	Percent of Adults Returned to Umatilla R.
1986	BFH	9.1	357	2,309	0.78	82.2
1987	BFH	10.6	237	493	0.31	81.9
1988	BFH	9.3	527	1,358	0.59	75.1
1989	BFH	11.0	195	466	0.24	89.4
1990	BFH	8.9	21	61	0.03	82.6
1990	CFH	18.7	0	0	0.00	---
1991	BFH	14.5	29	183	0.20	92.5
1991	CFH	20.3	0	0	0.00	---
1991	UFH	8.3	12	78	0.04	96.6
1992	BFH	12.1	199	2,320	0.57	94.6
1992	UFH	8.4	17	127	0.06	98.0
1993	BFH	11.1	297	2,184	0.55	97.3
1993	UFH	8.7	22	86	0.03	91.9
1994	UFH	8.9	3	13	>0.01	100
1995	UFH	9.1	508	2,217	0.98	94.4
1996	CFH	16.3	49	559	0.56	97.6
1996	LWS	13.3	36	659	0.19	99.4
1996	UFH	11.6	642	3,054	0.80	95.0
1997	CFH	13.2	52	875	0.84	87.4
1997	LWS	14.5	36	779	0.26	71.7
1997	UFH	14.8	213	1,549	0.42	78.9
1998	CFH	14.4	74	1,297	1.30	69.3
1998	LWS	12.0	65	1,845	0.51	77.2
1998	UFH	12.9	509	3,768	1.05	81.6
1999	CFH	13.9	23	367	0.37	70.4
1999	LWS	12.1	4	106	0.03	100
1999	UFH	11.3	331	2,526	0.75	89.8
2000	WFH	15.7	24	815	0.22	80.1
2000	UFH	12.9	209	1,885	0.37	80.1
2001	LWS	16.9	10	156	0.05	86.4
2001	UFH	12.5	300	2,185	0.48	79.3
2002	LWS	15.6	24	873	0.23	86.3
2002	UFH	14.0	250	3,283	0.67	93.8
Mean	**BFH**	**10.8**	**233**	**1,172**	**0.41**	**87.0**
Mean	**CFH**	**16.1**	**40**	**620**	**0.61**	**64.9**

Mean	**LWS**	**14.1**	**29**	**736**	**0.21**	**86.8**
Mean	**WFH**	**15.7**	**24**	**815**	**0.22**	**80.1**
Mean	**UFH**	**11.3**	**251**	**1,731**	**0.47**	**90.0**

Appendix Table 2. Counts of spring Chinook salmon that returned to the Umatilla River mouth (run years 1988-2008). Data are adult females (F), and males (M), jacks (J), and subjacks (SJ). Means are for run years 1996-2008.

Run	HATCHERY		NATURAL		TOTAL	
Year	Adult	Jack	Adult	Jack	Adult	Jack
1988[a]	13	0	---	---	**13**	**0**
1989[a]	68	96	---	---	**68**	**96**
1990[a]	2,158	32	---	---	**2,158**	**32**
1991[a]	1,294	36	---	---	**1,294**	**36**
1992	460	4	---	---	**460**	**4**
1993[b]	---	---	---	---	**1,205**	**16**
1994[b]	---	---	---	---	**263**	**8**
1995[b]	---	---	---	---	**388**	**82**
1996	2,076	120	76	1	**2,152**	**121**
1997	2,032	2	162	0	**2,194**	**2**
1998	343	20	66	0	**409**	**20**
1999	1,743	207	22	2	**1,765**	**209**
2000	4,261	136	380	7	**4,641**	**143**
2001	4,505	219	270	36	**4,775**	**255**
2002	5,463	141	197	84	**5,660**	**225**
2003	3,884	143	287	6	**4,171**	**149**
2004	2,929	255	341	25	**3,270**	**280**
2005[c]	1,963	357	203	5	**2,166**	**362**
2006[d]	4,937	121	244	4	**5,181**	**125**
2007[d]	3,005	393	138	18	**3,143**	**411**
2008[d]	1,861	507	173	13	**2,034**	**520**
Mean	**2,999**	**202**	**198**	**16**	**3,197**	**218**



Appendix Figure 1. Non-Umatilla origin adult hatchery spring Chinook salmon enumerated at Three Mile Falls Dam, Umatilla River, Oregon, run years 1993-2007. Top: Mean and SE for number of fish by smolt release origin and their percent contribution to the hatchery and entire run 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 run to Three Mile Falls Dam.

Appendix Table 3. Spring Chinook spawning escapement in the Umatilla River (run years 1996-2008).

	HATCHERY			NATURAL			TOTAL			Percent
Run Year	Adult Female	Adult Male	Jack	Adult Female	Adult Male	Jack	Adult Female	Adult Male	Jack	of Adult Return
1996	953	757	71	32	30	1	985	787	72	82.3
1997	699	482	1	67	71	0	766	553	1	60.1
1998	70	73	9	39	25	0	109	98	9	50.6
1999	630	380	112	8	12	1	638	392	113	58.4
2000	1,440	1,066	70	128	135	5	1,568	1,201	75	59.7
2001	1,832	1,104	84	111	66	18	1,943	1,170	102	65.2
2002	2,241	1,231	103	82	44	9	2,323	1,275	112	63.6
2003	1,348	744	59	97	55	5	1,445	799	64	53.8
2004	1,003	559	131	93	82	16	1,096	641	147	53.1
2005	763	383	250	62	41	4	825	424	254	57.6
2006	1,828	960	59	83	88	3	1,911	1,048	62	57.4
2007	962	672	258	48	42	14	1,010	714	272	55.1
2008	433	448	357	42	58	11	475	506	368	48.2
Mean	**1,147**	**701**	**101**	**71**	**58**	**6**	**1,218**	**759**	**107**	**59.7**

Appendix Table 4. Annual angling effort, catch, and harvest of spring Chinook salmon in the Umatilla River non-tribal fishery, run years 1990-2008. No fisheries occurred in 1992, 1994, 1995, and 1998.

	No. Fishable Days	No. Days Sampled	No. Anglers Interviewed	No. Angler Hours	No. Harvested		No. Released		Percent of Run
Year					Hatchery	Natural	Hatchery	Natural	Harvested
1990	12	11	80	1,248	20	0	0	0	0.9
1991	12	12	235	1,544	23	0	0	0	1.7
1993	16	12	184	1,528	18	0	0	0	1.5
1996	20	15	495	2,900	206	0	0	0	9.1
1997	23	23	395	3,341	28	2	0	0	1.4
1999	23	20	238	552	11	2	5	0	0.6
2000	152	51	1,317	13,472	544	40	83	8	12.2
2001	152	63	1,722	14,608	510	33	15	1	10.8
2002	93	40	1,146	17,190	724	25	17	0	12.7
2003	84	34	1,736	NA	647	41	23	0	15.9
2004	103	32	653	NA	308	26	12	3	9.4
2005	28	18	394	3,613	155	15	0	0	6.8
2006	62	36	676	6,539	633	0	188	10	12.0
2007	44	28	540	4,215	279	0	28	1	7.9
2008	70	58	389	4,260	119	0	16	4	4.7
90-99 Mean	**18**	**16**	**271**	**1,852**	**51**	**<1**	**1**	**0**	**2.5**
00-08 Mean	**88**	**40**	**953**	**9,128**	**435**	**20**	**43**	**3**	**10.3**

Appendix Table 5. Annual angling effort and harvest of spring Chinook salmon in the Umatilla River tribal fishery, run years 1990-2008. No fisheries occurred in 1992, 1994, 1995, and 1998. Harvest estimate for 2008 is preliminary.

Year	NUMBER HARVESTED		Percent of Run Harvested
	Hatchery	Natural	
1990	NA	NA	NA
1991	82	0	6.2
1993	176	0	14.4
1996	161	6	7.3
1997	167	20	8.5
1999	108	2	5.6
2000	630	65	14.5
2001	520	34	11.0
2002	616	23	10.9
2003	371	27	9.2
2004	413	47	13.0
2005	189	14	8.0
2006	566	31	11.3
2007	356	19	10.6
2008	215	18	9.1
90-99 Mean	**139**	**9**	**8.4**
00-08 Mean	**431**	**31**	**10.8**

Appendix Table 6. Contributions of spring Chinook salmon from the Umatilla Hatchery Program to fisheries outside of the Umatilla River Basin, 1990-2007. Harvest reporting for recent years may be incomplete.

		COLUMBIA RIVER			MID-COLUMBIA TRIBUTARY	
Year	Ocean Fisheries	Tribal Fisheries	Non-Tribal Commercial Fishery	Non-Tribal Recreational Fishery	Recreational Fisheries	**TOTAL**
1990	7	148	13	53	0	**221**
1991	0	163	30	51	0	**244**
1992	4	227	7	10	0	**248**
1993	4	122	6	14	0	**146**
1994	0	3	1	13	0	**17**
1995	0	17	0	0	0	**17**
1996	10	60	5	0	35	**110**
1997	8	26	0	0	0	**34**
1998	0	4	0	0	0	**4**
1999	0	19	0	0	0	**19**
2000	4	62	18	11	0	**95**
2001	25	180	31	343	31	**610**
2002	0	415	307	621	14	**1,357**
2003	0	99	63	271	0	**433**
2004	30	43	164	355	0	**592**
2005	0	20	58	319	0	**397**
2006	0	41	10	234	0	**285**
2007	0	0	80	187	0	**267**
90-99 Mean	**3**	**79**	**6**	**14**	**3**	**105**
00-07 Mean	**7**	**108**	**91**	**293**	**6**	**505**

Appendix Table 7. Water quality comparisons between Michigan and Oregon raceways during production 1992-1998.

			Inlet			Outlet		
Parameter	Strategy	Pass	N	Means	Min-Max	N	Means	Min-Max
Temperature (˚C)	Michigan	A	89	13.9	11.4-16.3	89	13.9	11.4-16.1
		B	89	13.9	11.4-16.4	89	14.0	11.4-16.6
		C	57	14.0	11.2-16.1	57	14.0	11.2-16.3
	Oregon	A	208	13.5	10.4-16.2	208	13.6	10.6-16.2
		B	146	13.6	10.5-16.4	146	13.7	10.6-16.4
pH	Michigan	A	83	7.84	6.64-8.70	83	7.80	6.65-8.65
		B	83	7.82	6.67-8.65	83	7.80	6.66-8.65
		C	52	7.80	6.63-8.17	51	7.76	6.65-8.20
	Oregon	A	198	7.89	6.65-8.77	198	7.90	6.67-8.76
		B	138	7.90	6.63-8.74	138	7.87	6.68-8.73
Oxygen (mg/L)	Michigan	A	85	11.1	7.9-13.7	84	9.7	7.3-11.8
		B	85	11.0	8.8-13.7	85	9.7	7.9-11.8
		C	54	10.7	8.5-14.0	53	9.5	7.3-11.7
	Oregon	A	203	10.3	7.6-14.5	203	9.2	6.2-11.9
		B	143	9.7	7.5-13.5	143	8.5	4.6-14.7
Unionized Ammonia (µ/L)	Michigan	A				62	0.33	0.02-1.35
		B				62	0.55	0.02-2.56
		C				30	0.58	0.03-1.42
	Oregon	A				157	0.30	0.03-1.59
		B				114	0.56	0.07-2.53

Appendix Table 8. Spring Chinook salmon abundance by life stage reared at Umatilla (UFH), Little White Salmon (LWSH), Carson (CNFH), and Willard Fish Hatcheries for 1991-2007 broods. 0+ = subyearling, 1+ = yearling. Additional egg sources from Ringgold (RIN) and Lyons Ferry (LF) hatcheries.

Brood year	Number of Umatilla River females spawned	Rearing and release strategies	Egg source	Number of eggs taken	Number Of eyed eggs received	Number of fry	Number of smolts released
			Umatilla Fish Hatchery				
1991		1+, spring	CNFH		332,000	322,704	208,880
1992		1+, spring	CNFH		319,000	227,447	205,400
1993		1+, spring					286,243
1994		1+, spring	RIN/LF		602,000	432,236	381,122
1995		1+, spring	CNFH/LF/LWSH		227,000	218,296	226,909
1996		1+,spring	CNFH/LF/UFH		487,612	391,065	383,449
1997		1+, spring	UFH				254,324
1998	96	1+, spring	UFH	455,953	82,000	441,628	360,056
1999	276	1+, spring	UFH	942,988		362,104	338,723
2000	300	1+, spring	UFH	1,120,995		526,628	513,913
2001	282	1+, spring	UFH	1,175,281		477,691	460,048
2002		1+, spring	UFH	986,145			493,248
2003		1+, spring	UFH	1,051,246			584,775
2004		1+, spring	UFH	1,148,349			590,723
2005		1+, spring	UFH	1,040,529			666,223
2006		1+, spring	UFH	968,200			836,192
2007		1+, spring	UFH	1,071,664			
			Little White Salmon Fish Hatchery				
1997		1+, spring	UFH	396,000			379,693
1998		1+, spring	RIN	307,624			294,267
1999		1+, spring	UFH	398,784			355,776
2001		1+, spring	UFH	364,752			346,664
2002		1+, spring	UFH				374,745
2003		1+, spring	UFH				205,264
2004		1+, spring	UFH				213,088
		1+, spring	UFH				
			Carson National Fish Hatchery				
1997		1+, spring	CNFH			102,462	103,838
1998		1+, spring	CNFH			100,067	99,916
1999		1+, spring	CNFH			100,309	100,111
			Willard Fish Hatchery				
2000		1+, spring	UFH			401,065	394,348
2005		1+, spring	UFH				224,397

Appendix Table 9. Egg take and survival of Umatilla River stock Spring Chinook (brood years 1997-2008) reared at Umatilla Hatchery during 1998-2007.

Brood Year	Number of eggs taken or received	Egg-to-fry survival (%)	Egg-to-smolt survival[a] (%)
1997	1,029,237	81	78
1998	455,953	97	82
1999	942,988	81	78
2000	1,120,955	84	82
2001	1,175,281	81	80
2002	986,145	86	86
2003	1,051,246	80	77
2004	1,148,349	73	71
2005	1,040,529	87	86
2006	968,200	88	86
2007	1,071,664	85	

[a] *Survival estimate is based on green egg-to-smolt stage*.

Appendix Table 10. Rearing conditions immediately before transfer for spring Chinook salmon at Umatilla Fish Hatchery in Oregon raceways during 1991-2008.

Brood year	System	Maximum density (lb/ft^3)	Maximum loading (lb/gal/min)	Total number reared per gpm in system
1991	Oregon	1.0	5.0	83
1992	Oregon	1.0	4.8-5.0	84
1993	Oregon	0.9-1.1	4.6-5.4	74
1994	Michigan	2.4-2.7	5.9-6.6	115
	Oregon	1.2-1.3	5.6-6.2	94
1995	Oregon	1.0	4.8-4.9	92
1996	Michigan	2.0	4.9	164
	Oregon	0.9	4.2	91
1997	Michigan	3.5	8.4	157
	Oregon	0.7-1.3	3.2-6.2	46
1998	Michigan	1.73	4.2	159
	Oregon	0.75	3.6	84
1999	Michigan	1.70	4.1	143
	Oregon	0.77	3.7	90
2000	Michigan	1.76	4.2	163
	Oregon	0.68	3.3	84
2001	Michigan	1.56-1.65	3.7-3.9	158
	Oregon	0.52-0.62	3.0-4.9	84
2002	Michigan	1.04-1.77	2.5-4.2	176
2003	Michigan	1.02-1.64	2.4-3.9	157
2004	Michigan	1.02-1.0	2.4-3.6	158
2005	Michigan	1.27-1.97	3.0-4.7	177
2006	Michigan	1.13-2.53	2.7-6.0	245

Appendix Table 11. Mean length, weight, and condition factor at transfer for yearling spring Chinook salmon reared in Michigan or Oregon raceways at Umatilla Hatchery, 1991-2006 brood years.

Brood Year	System	Length (mm)	Weight (g)	Condition factor
1991[a]	Oregon	158.8	50.5	1.20
1992	Oregon	163.0	55.2	1.23
1993[b]	Michigan	166.9	57.8	1.24
	Oregon	171.0	56.9	1.16
1994[b]	Michigan	160.9	46.4	1.11
	Oregon	167.7	53.0	1.12
1995[b]	Oregon	149.2	45.9	1.35
1996	Michigan	147.1	39.9	1.21
	Oregon	145.9	40.0	1.25
1997	Michigan	131.8	28.3	1.22
	Oregon(10/15/1998)	108.3	15.7	1.21
	Oregon(1/20/1999)	137.9	33.4	1.23
1998	Michigan	133.7	31.8	1.29
	Oregon (11/1/99)	122.2	26.3	1.41
	Oregon (1/4/00)	135.6	32.4	1.30
1999	Michigan	137.1	32.8	1.27
	Oregon (11/8/00)	134.1	32.3	1.28
	Oregon (1/8/01)	139.7	35.7	1.29
2000	Michigan	133.7	30.4	1.25
	Oregon (11/2/01)	117.2	21.3	1.30
	Oregon (1/7/02	136.5	33.5	1.28
2001	Oregon (11/15/02)	120.0	21.9	1.26
	Michigan (1/09/03)	134.0	28.8	1.20
	Oregon (1/08/03)	132.5	29.0	1.21
2002	Michigan (11/14/03)	113.5	20.4	1.40
	Michigan (1/15/04)	133.8	30.3	1.24
2003	Michigan (1/13/05)	137.4	31.3	1.23
2004	Michigan (11/08/05)	114.6	19.2	1.26
	Michigan (1/06/06)	132.2	28.2	1.22
2005	Michigan (11/10/06)	121.4	25.4	1.42
	Michigan (1/26/07)	142.6	35.0	1.21
2006	Michigan (11/13/07)	118.8	19.1	1.22
	Michigan (11/14/07)	115.3	21.2	1.30
	Michigan (1/10/08)	132.4	26.9	1.25

[a] *Brood years 1991-92 were not acclimated and were released directly into the Umatilla River.*
[b] *Fish from the 1993 through 1995 brood years were measured at release after acclimation, standard errors were not determined.*

Appendix Table 12. Proportion descaled, partially descaled, and undamaged yearling spring Chinook salmon reared in Michigan and Oregon raceways at Umatilla Hatchery, brood years 1991-2006.

Brood year	System[a]	Smolting			Descaling		
		Smolt	Interme-diate	Parr	Descaled[b]	Partially descaled[c]	Undam-aged[d]
1991	Oregon				0.01	0.00	0.99
1992	Oregon				0.01	018	.081
1993	Michigan				0.03	0.24	0.74
	Oregon				0.00	0.15	0..85
1994	Michigan				0.13	0.54	0.33
	Oregon				0.01	0.12	0.87
1995	Oregon				0.01	0.13	0.86
1996	Michigan				0.00	0.17	0.83
	Oregon				0.01	0.24	0.76
1997	Michigan				0.03	0.53	0.44
	Oregon(10/15/1998)				0.01	0.00	0.99
	Oregon(1/20/1999)				0.01	0.87	0.12
1998	Michigan	0.00	1.00	0.00	0.00	0.00	1.00
	Oregon(11/1/1999)	0.00	0.98	0.02	0.00	0.00	1.00
	Oregon(1/4/2000)	0.00	1.00	0.00	0.00	0.00	1.00
1999	Michigan	0.00	1.00	0.00	0.00	0.00	1.00
	Oregon(11/8/2000)	0.00	1.00	0.00	0.00	0.00	1.00
	Oregon(1/8/2001)	0.00	1.00	0.00	0.00	0.00	1.00
2000	Michigan	0.00	1.00	0.00	0.00	0.00	1.00
	Oregon(11/2/2001)	0.00	1.00	0.00	0.00	0.00	1.00
	Oregon(1/7/2002)	0.00	1.00	0.00	0.00	0.00	1.00
2001	Oregon (11/15/02)	0.00	1.00	0.00	0.00	0.00	1.00
	Michigan (1/09/03)	0.00	1.00	0.00	0.00	0.00	1.00
	Oregon (1/08/03)	0.00	1.00	0.00	0.00	0.00	1.00
2002	Michigan (11/14/03)	0.00	1.00	0.00	0.00	0.00	1.00
	Michigan (1/15/04)	0.00	1.00	0.00	0.00	0.00	1.00
2003	Michigan (1/13/05)	0.00	1.00	0.00	0.00	0.00	1.00
2004	Michigan (11/08/05)	0.00	1.00	0.00	0.00	0.00	1.00
	Michigan (1/06/06)	0.00	1.00	0.00	0.00	0.00	1.00
2005	Michigan (11/10/06)	0.00	1.00	0.00	0.00	0.01	0.99
	Michigan (1/26/07)	0.00	1.00	0.00	0.00	0.01	0.99
2006	Michigan (11/13/07)	0.00	1.00	0.00	0.00	0.00	1.00
	Michigan (11/14/07)	0.00	1.00	0.00	0.00	0.01	0.99
	Michigan (1/10/08)	0.00	1.00	0.00	0.00	0.01	0.99

[a] *Data are mean of A and B passes.*

[b] *More than 25 % descaling on either side of the fish.*

[c] *Descaling = 3 to 25 % on either side of the fish.*

[d] *Less than 3 % descaling on either side of the fish.*