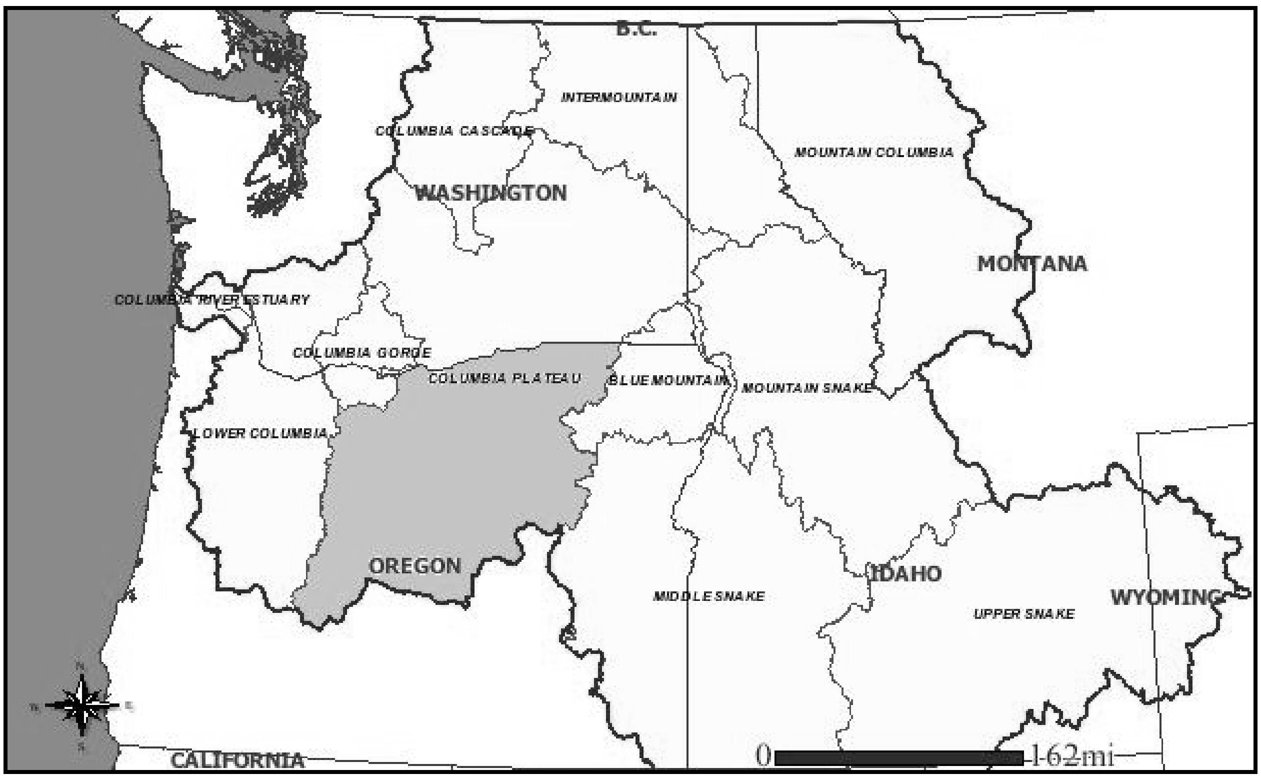
U.S. Fish and Wildlife Service

Pacific Region

Hatchery Review Team

Columbia River Basin
Columbia Plateau Province, Deschutes River Watershed



Warm Springs National Fish Hatchery

Assessments and Recommendations

Final Report, Appendix D:
Complete text of comment letters received from Stakeholders

May 2006

Appendix D: Comment letters from Stakeholders

COLUMBIA RIVER INTER-TRIBAL FISH COMMISSION
729 NE Oregon, Suite 200 • Portland, OR 97232 • Phone: 503/238-0667
Fax: 503/235-4228

Date: February 15, 2006

To: Amy Gaskill
External Affairs
US Fish and Wildlife Service
911 NE 11th Avenue
Portland, OR 97232
amy_gaskill@fws.gov

From: Peter F. Galbreath
Conservation Fisheries Scientist
Fish Science Department
503-731-1250
galp@critfc.org

Subject: comments re. USFWS Assessments and Recommendations – Warm Springs NFH

Please accept the following comments regarding the Assessments and Recommendations report of the USFWS Columbia River Basin Hatchery Review team for the Warm Springs National Fish Hatchery.

1.) Factorial mating of hatchery broodstock

The 2002-2006 WSNFH Operational Plan and Implementation Plan describes the spawning protocol for hatchery broodstock as follows: random single-pair matings when the total number approaches the target number of 630, and 2x2 factorial matings when the total number is less than 400. And, subdivision of milt to fertilize 2 (or more) females when the number of females exceeds that of males. In their Assessments and Recommendations report, the USFWS Review Team does not include any recommendations for change in the current spawning practices.

I would recommend, however, that policy be modified to require systematic factorial mating of broodstock up to amnd including the maximum of 630 fish. Full factorial mating (all females x all males) should be performed on spawning days when the number of broodstock per sex is low, e.g. less than 10 per one or both sexes. When the number is greater than this, then spawning should be performed as a series of partial factorial matings, e.g. 5(or more)x5(or more). When the sex ratio of ripe broodstock is skewed from 1:1, a series of unbalanced factorial matings should be performed, e.g. if sex ratio is 1:2, a series of 5x10 matings would be appropriate.

Practically, a given factorial mating would involve sublotting the eggs from each female into multiple plastic bowls – the number being equal to the number of available males. Milt from the males would be stripped into separate plastic cups, then a portion added to one sublot of eggs from each female. Both the subdivision of the eggs and of the milt could be performed “by eye” to provide approximately equal amounts per sublot. Within a minute following addition of milt and then water to activate and fertilize the eggs, the sublots for a given female would be repooled and egg incubation/fry rearing would proceed as currently practiced – with eggs from a given female incubated separately while awaiting results of ELISA analyses for BKD.

The advantage of factorial mating is that it results in an increase in effective population size (Ne) – due to its effect to better equalize the number of progeny produced per broodfish. The advantage of factorial mating relative to random single-pair mating is greatest when the total number of broodstock within spawning days is low – such as at the tail ends of the spawning season. Also, for a given number of broodstock, the advantage increases with increase in variation in gamete quality among the broodstock (e.g., when females exhibit a range of under- to over-ripe eggs, or when males exhibit high variation in sperm concentration and/or motility). And, when sex-ratio is skewed from 1:1, some sort of factorial design is required if all available broodstock are to be used (so as to maximize Ne). The disadvantage of factorial mating is simply a small increase in work during the day of spawning.

The benefits of factorial mating are well described in:

Miller, L. M. and A. R. Kapuscinski. 2003. Chapter 14 Genetic guidelines for hatchery supplementation in E. M. Hallerman, editor. Population genetics: Principles and applications for fisheries scientists. American Fisheries Society, Bethesda Maryland (see pp. 346-347).

Allendorf, F. W. 1992. Delay of adaptation to captive breeding by equalizing family size. Conservation Biology 7: 416-419.

Dupont-Nivet M., M. Vandeputte, P. Haffray and Bernard Chevassus. 2006. Effect of different mating designs on inbreeding, genetic variance and response to selection when applying individual selection in fish breeding programs. Aquaculture 252:161-171.

In their review of Puget Sound and Coastal Washington State hatchery programs, the Hatchery Scientific Review Group (HSRG) cited the advantages of factorial mating, though, erroneously in my opinion, did not clearly and strongly recommend its practice over that of random single-pair matings - HSRG. April 2004. Hatchery Reform: Principles and recommendations of the HSRG. Long Live the Kings, 1305 Fourth Avenue, Suite 810, Seattle, WA 98101 (see pp. 39-40, section: Use genetically benign spawning protocols that maximize effective population size)

Although most hatcheries generally practice random single-pair matings, (partial) factorial mating is being adopted more widely, e.g., Cle Elum Hatchery spring Chinook. Those hatcheries where factorial mating is systematically performed, typically utilize small designs - 2x2 or 3x3 partial factorial designs. My recommendation would be that at least a 5x5 design be used to assure benefits of the procedure.

2.) Broodstock Choice and Collection/Hatchery and Natural Spawning - NOB and HOS limitations

The USFWS Assessments and Recommendations for Broodstock Choice and Collection/Hatchery and Natural Spawning [WS1(a-e), p.23] are indicated as minor modifications to the policies described in the 2002-2006 Operational Plan for WSNFH. However, the exact nature of their recommended modifications to the current policies is unclear.

While I strongly support the CTWSRO/USFWS “two-stock concept” of the Operational Plan for the WSHFH, I would recommend that it not be applied as strictly as described in years of exceptionally high and exceptionally low natural origin (NO) adult returns.

a.) The stated objective in the current (2002-2006) Operational Plan for the WSNFH is to achieve a ten-year average of 10% NOB (natural origin adults incorporated as hatchery broodstock). However, the Plan also restricts the number of NOB such that it does not exceed 5% of the total NO escapement in any given year, and is applied only when NO escapement exceeds 800 - see table below: Current and Proposed Sliding Scale for Calculation of Number of NOB, Current Scale columns (and see

Table, p. 3 in Operational Plan). The Review Team made no specific recommendations for change in the current policies (WS1a and b), although they do call for a review of existing NOB “floor” and “ceiling” figures (WS1c).

Current and Proposed Sliding Scale for Calculation of Number of NOB

Projected Wild (NO) Escapement	Current Scale (5% of NO) # NOB	% NOB	Proposed Scale # NOB	% NOB
<800	0	0	0	0
800-899	31	5	31	5
900-999	38	6	38	6
1000-1099	45	7	45	7
1100-1199	50	8	50	8
1200-1299	57	9	57	9
1300-1399	63	10	63	10
1400-1499	69	11	95	15
1500-1599	76	12	126	20
1600-1699	82	13	158	25
1700-1799	88	14	189	30
1800-1899	95	15	221	35
1900-1999	100	16	252	40
20002099	107	17	284	45
2100-2199	113	18	315	50
2200-2299	120	19	315	50
>2300	126	20	315	50

Under the current restriction of a maximum 5% removal of NO adults for use as NOB, the target of a ten-year average of 10% NOB could not have been achieved since 1992, as illustrated in the attached table Adult Returns to WSNFH, under the 10-year Average – Actual column. The calculations presume that 630 broodstock were spawned each year, and that HO returns were sufficient to make up for the remainder of the 630 needed annually for hatchery broodstock (though in fact, this was not always the case). The problem lies in the fact that the 5% restriction constrains increasing % NOB in high return years in such a manner as would compensate for low/zero % NOB values in low return years.

Past stock-recruitment data were used by CTWSRO and USFWS to establish the number 1300 as the target level for escapement to the Warms Springs river above the hatchery dam. In high return years, when NO adults are counted at the WSNFH trap in excess of the target level of 1300 (e.g., as occurred in recent years in 2000-2004), one could presume that the upstream habitat will be increasingly “fully seeded”. As such, there would be no reason not to use an increased proportion of the “extra” NO adults for incorporation into the hatchery broodstock. The rationale for integration of NO fish among the broodstock is to minimize genetic divergence of the broodstock from the wild population. Knowing that the greater the proportion of NO fish among the broodstock the lesser is the chance for such divergence to occur, then when “excess” NO fish are available, it makes sense to use them as much as possible as NOB. If there is a tendency over successive generations for the hatchery stock to diverge genetically from the natural population, then during the occasional “good years” (e.g., 2000-2004) large proportions of NO adults should be incorporated into the broodstock to redress any divergence that may have occurred during low return (low % NOB) years (e.g., during the 1990’s). Such a policy conforms wholly with the rationale of the Review Team’s recommendations for a minimum average 10% NOB (WS1a), and for assurance that NOB exceeds HOS (WS1c).

I propose to the CTWSRO and the USFWS Review Team that they revise the sliding scale table used to calculate the number of NO adults incorporated into the hatchery broodstock, in the manner illustrated in the table above - Current and Proposed Sliding Scale for Calculation of Number of NOB, under the Proposed Scale - # NOB and % NOB columns. The revised scale makes no changes relative to current practices when escapement is 1399 or less. However, as escapement exceeds 1400, I suggest that the percent of NO used as NOB should increase to 15%, and up to 50% by the time NO escapement reaches

2100-2199. Had this proposed scale been used over the past years, the 10-year average of % NOB would have exceeded the target of 10% in all years except 1998-2000 (see attached table Adult Returns to WSNFH, under the column 10-year Average – Proposed). The 50% limit in the proposed scale was arbitrarily chosen, and in fact, I see no strong argument against increasing it to 100% by the time NO escapement reaches 2200.

b.) Current policy of the WSNFH is that "only wild (unmarked) fish would be passed upstream above the hatchery" (Stainbrook and Greene 1984 and Jackson 1984 *in* p. 2 of the Operational Plan) The Review Team report includes no specific recommendations that would modify this policy. However, it is known that some HO fish do inadvertently escape upstream (estimated to be as much as 10% of the total escapement) due to CWT tag loss and to operational errors of the automatic trap which is to divert fish possessing a CWT into the hatchery holding ponds (all HO smolts are CWT tagged prior to release). Recommendation WS1e of the Review Team is that this HO escapement be minimized. Ideally, it will go to zero if improvements in the design and operation of the trap, and improvements to CWT tagging procedures are optimized, as described in the Projects to Implement/Improvements Needed section of the 2002-2006 Operational Plan (p.19).

However, an uncompromising policy to exclude HO adults from the natural spawning population can work against the overall objective of maintaining a "healthy" wild population of spring Chinook in the river above the WSNFH. While a healthy salmon population can be expected to show year-to-year fluctuations in abundance, NO escapement (NOS) of Warm Springs spring Chinook was continually well below the target level of 1300 during the 9-year (2 Chinook generations) period from 1991 to 1999, going as low as 271 in 1998. This situation certainly precluded the population from being qualified as healthy.

The WSNFH program was initiated using an integrated versus a segregated hatchery broodstock management protocol. The rationale behind this decision was to ensure that little or no genetic alteration of the natural population would result from accidental escapement of HO adults, and to create a hatchery population which would provide "a genetic repository and demographic buffer against catastrophic loss" (p. 20 of Review Team report). The judiciousness of this choice is obvious, as it has been established that CWT tag loss and errors in trap operation have resulted in a rate of HO escapement estimated at up to 10% of total upstream escapement. However, there are no policy guidelines on how to implement the second rationale - use of the hatchery stock as a genetic repository. While procedures to incorporate NO adults into the hatchery broodstock have no doubt been effective in minimizing genetic divergence of the hatchery from the natural stock (and could be even more so with adoption of the preceding recommendation 2a), there are no stated policies defining "catastrophic loss ", nor when and how to utilize the genetic repository represented in the hatchery stock. Instead, there exists only the policy that no (zero) HO fish will be intentionally permitted upstream of the WSNFH dam for natural spawning. It is essential that this policy be amended, so as to define those conditions of reduced abundance which would trigger inclusion of HO adults (or smolts) in the upriver area – as a means of preventing significant demographic, genetic and management harm resulting from "catastrophic" low population size.

The HSRG produced a useful Technical Discussion Paper entitled, "When do you start a conservation hatchery program?" (http://www.lltk.org/pdf/Conservation_Programs_Mar05.pdf). The paper provides a simple means of roughly estimating when it would be prudent to utilize hatchery supplementation on a population which is declining in abundance. The methodology presumes that an effective population size (Ne) of at least 500 is required to sufficiently minimize effects of genetic drift - at lower abundance levels, genetic drift will lead to progressive loss the genetic variance needed to maintain population viability. Ne can be estimated as the observed (census) population size (escapement; Nc) times a factor which estimates the proportion of Nc equivalent to the effective number of breeders (Nb) – a number which is always less than Nc due to differential mating success among adults, variation in family size, etc. This factor has been estimated empirically to be between 0.1 to 0.33. The Nb value is then multiplied by the average number of years per generation for the species in question (estimated as 4 for Chinook salmon) to provide an estimate of Ne, or retrospectively, one can estimate Ne by summing the Nb values for 4 consecutive years.

Retrospective estimates of Ne for wild Warms Springs Chinook are provided for effective breeder factors of 0.1, 0.25 and 0.33 in the attached table - Ne of Wild (NOS) Adult Returns to WSNFH – calculated for a given year by summing the Nb values for the year in question and the previous 3 years. When presuming an effective breeder factor of 0.33, historical WSNFH data for wild spring Chinook show that Ne never went below the 500 critical level, even during the 1990s when abundance levels were the lowest. When presuming a factor of 0.25, Ne also remains above 500, although it does go into a range between 569 and 730 during the years 1994 to 1999. And presuming the most pessimistic factor of 0.1, Ne was below 500 from 1993 to 2000.

The HSRG Technical Discussion Paper states that variation in individual reproductive success will likely diminish when population density is low, permitting use of an effective breeder factor at the high end of the range. If this is the case, NO escapement should be positively correlated with such measures as adults-per-redd. While a positive correlation is observed in the Warm Springs data (1977-2002), the correlation is weak. I would propose that presumption of an effective breeder factor of 0.25 would be more prudent for management purposes in this system.

As indicated above, retrospective estimates of Ne for the spring Chinook based on a factor of 0.25 approached though did not go below the critical level of Ne=500, due to the multi-year generation span of Chinook, and because return numbers were never extremely low for four consecutive years. Nonetheless, one must manage prospectively, and consider what actions to take (or not) when predicted total escapement (annual Nb values) are perilously low (such as occurred several times during the 1990s). Currently, the policy is to take no actions, and to simply hope that conditions will improve in future years such that the population will resurge. This, I feel, is imprudent, particularly given the fact that the WSNFH program has performed such a good job in creating a genetic repository for the natural population.

I propose to the CTWSRO and the USFWS that they adopt as management policy for the WSNFH, the threshold number of Ne = 500 for Chinook salmon as the minimum allowable annual escapement for spring Chinook salmon – the threshold at which the genetic repository created by the integrated hatchery program should be exploited. Ne would be calculated based on a given year's projected NO escapement (Nc) x 4, and using an effective breeder factor of 0.25. When the predicted Ne is less than the critical threshold of 500 (which translates to a projected Nc of 500 for the year in question), then supplementation of the natural population with hatchery origin adults should be enacted. Data collected at the WSNFH indicates that a return (Nc) of <500 has occurred four times in the past 30 years. If this proposed policy had been in place, it would have translated to supplementation of the natural population with the following number of HO adults: 65 in 1994, 263 in 1995, 229 in 1998, and 7 in 1999. I deem this policy to be conservative (possibly overly conservative), yet sensible, as it would help buffer the natural population from the deleterious genetic and demographic effects that are inevitable when the population is permitted to go to exceedingly low levels.

The CTWSRO and the USFWS are rightfully proud of the manner in which they have been able to protect and maintain the Warm Springs population of spring Chinook as wild and natural, and of the manner in which they have successfully developed a hatchery stock at WSNFH which is well integrated with the natural population, such that any genetic divergence between the two has been minimized. Just as the current unintentional escapement of HO adults into the river upstream of the hatchery does not compromise their view of the spring Chinook population as being wild and natural, so the judicious supplementation of the population during the occasional times of critically low abundance should not be viewed as denigrating its status.

Adult Returns to WSNFH

RY	ID	Total	Actual % NOB *	Proposed % NOB *	10-Year Average Actual	10-Year Average Proposed
1975	W	2182	18	50		
1976	W	2878	20	50		
1977	W	1606	13	25		
1978	W	2660	20	50		
1979	W	1395	10	10		
1980	W	1002	8	8		
1981	All	1660				
	H	85				
	W	1575	12	20		
1982	All	2370				
	H	916				
	W	1454	11	15		
1983	All	1912				
	H	371				
	W	1541	12	20		
1984	All	2282				
	H	992				
	W	1290	9	9	13.3	25.7
1985	All	2264				
	H	1109				
	W	1155	8	8	12.3	21.5
1986	All	2060				
	H	349				
	W	1711	14	30	11.7	19.5
1987	All	2525				
	H	742				
	W	1783	14	30	11.8	20
1988	All	2471				
	H	824				
	W	1647	13	25	11.1	17.5
1989	All	3947				
	H	2538				
	W	1409	11	15	11.2	18
1990	All	3178				
	H	1311				
	W	1867	15	35	11.9	20.7
1991	All	1461				
	H	644				
	W	817	5	5	11.2	19.2
1992	All	1856				
	H	791				
	W	1065	8	8	10.9	18.5
1993	All	847				
	H	309				
	W	538	0	0	9.7	16.5
1994	All	487				
	H	52				
	W	435	0	0	8.8	15.6
1995	All	477				
	H	240				
	W	237	0	0	8	14.8
1996	All	1994				
	H	707				
	W	1287	9	9	7.5	12.7
1997	All	2008				
	H	1138				

	W	870	5	5	6.6	10.2
1998	All	924				
	H	653				
	W	271	0	0	5.3	7.7
1999	All	3263				
	H	2770				
	W	493	0	0	4.2	6.2
2000	All	9450				
	H	6745				
	W	2705	20	50	4.7	7.7
2001	All	6718				
	H	4466				
	W	2252	19	50	6.1	12.2
2002	All	10438				
	H	8802				
	W	1636	13	25	6.6	13.9
2003	All	7424				
	H	6023				
	W	1401	11	15	7.7	15.4
2004	All	5973				
	H	3544				
	W	2429	20	50	9.7	20.4
*2005 ** *	*All*	*2600*				
	H	*2000*				
	W	*600*	0	0	9.7	20.4

* presuming HO returns sufficient to make up for the remainder of the 630 needed for Hatchery broodstock
** rough estimation

Ne of Wild (NOS) Adult Returns to WSNFH

RY	ID	Total (Nc)	Ne* (Nb=0.33Nc)	Ne* (Nb=0.25Nc)	Ne* (Nb=0.1Nc)
1975	W	2182			
1976	W	2878			
1977	W	1606			
1978	W	2660	3078	2332	932.6
1979	W	1395	2818	2135	853.9
1980	W	1002	2199	1666	666.3
1981	All	1660			
	H	85			
	W	1575	2189	1658	663.2
1982	All	2370			
	H	916			
	W	1454	1791	1357	542.6
1983	All	1912			
	H	371			
	W	1541	1839	1393	557.2
1984	All	2282			
	H	992			
	W	1290	1934	1465	586
1985	All	2264			
	H	1109			
	W	1155	1795	1360	544
1986	All	2060			
	H	349			
	W	1711	1880	1424	569.7
1987	All	2525			
	H	742			
	W	1783	1960	1485	593.9
1988	All	2471			
	H	824			
	W	1647	2078	1574	629.6
1989	All	3947			
	H	2538			
	W	1409	2162	1638	655
1990	All	3178			
	H	1311			
	W	1867	2213	1677	670.6
1991	All	1461			
	H	644			
	W	817	1894	1435	574
1992	All	1856			
	H	791			
	W	1065	1702	1290	515.8
1993	All	847			
	H	309			
	W	538	1415	1072	428.7
1994	All	487			
	H	52			
	W	435	942	714	285.5
1995	All	477			
	H	240			
	W	237	751	569	227.5
1996	All	1994			
	H	707			
	W	1287	824	624	249.7
1997	All	2008			
	H	1138			

	W	870	934	707	282.9
1998	All	924			
	H	653			
	W	271	879	666	266.5
1999	All	3263			
	H	2770			
	W	493	964	730	292.1
2000	All	9450			
	H	6745			
	W	2705	1432	1085	433.9
2001	All	6718			
	H	4466			
	W	2252	1888	1430	572.1
2002	All	10438			
	H	8802			
	W	1636	2338	1772	708.6
2003	All	7424			
	H	6023			
	W	1401	2638	1999	799.4
2004	All	5973			
	H	3544			
	W	2429	2547	1930	771.8
*2005 ** *	*All*	*2600*			
	H	*2000*			
	W	*600*	2002	1517	606.6

* Ne = sum of Nb of year in question plus Nb of 3 preceding years
** rough estimation

NFS

NATIVE FISH SOCIETY

Conserving biological diversity of native fish and protecting their habitats

February 11, 2006

Amy Gaskill, External Affairs
U.S. Fish and Wildlife Service
911 NE 11th Avenue
Portland, OR 97232

RE: Comments on Warm Springs National Hatchery Assessment and Recommendations

The Native Fish Society appreciates the opportunity to provide our review comments on the assessment of the Warm Springs Hatchery by the U.S. Fish and Wildlife Service. I have visited this hatchery several times and reviewed operations with hatchery staff. In the past we have provided comments on assessments of this hatchery (See attachments 1 and 2). My conclusion, based on these visits and assessments, is that the Warm Springs National Fish Hatchery operations and goals are superior to most other production hatcheries in the Columbia River basin and should be used as a model for hatchery operations in the basin.

The comments provided below are aimed at improving the present assessment of this hatchery program.

Page 1. Introduction: Include hatcheries along with habitat alterations, hydroelectric development and consumptive fisheries as a factor affecting salmon and steelhead in the Columbia River basin. To not include hatcheries in this line-up ignores all the research documenting the problems associated with hatchery and wild salmonid interaction and the conclusion in ESA-listing documents that conclude hatcheries have contributed to the decline of wild salmonids.

The introduction should include a statement about the value of wild salmonids, since a purpose of this hatchery assessment is to minimize hatchery and wild salmonid interactions. Laying the biological foundation for this purpose is important because it supports the goals of this assessment. Including a discussion about the biological organization of wild salmonids, local adaptation, productivity and the reasons for conservation is needed. Of course one of the reasons is that wild populations provide the genetic and life history diversity needed by hatcheries to maintain hatchery productivity and their contribution to fisheries.

The introduction should address National Marine Fisheries Service (NMFS) viability assessment measures. Since these measures are not included in the assessment, a comprehensive assessment is lacking. By excluding the NMFS viability criteria the FWS is creating a problem. The assessments used by the FWS and NMFS must be integrated so that a dual approach to salmonid conservation, management, assessment, monitoring, and recovery is avoided. We do not need separate plans developed by each federal agency. By avoiding this problem, data collection, risk assessment, management protocols and conservation plans are consistent between the two federal agencies with a shared authority over salmonid production, management and conservation in the Columbia River Basin.

Page 5. Benefits: A benefit of this hatchery design and operation that should be included is the conservation of wild spring Chinook and wild summer steelhead in the Deschutes basin. These populations in the Warm Spring River represent a genetic reserve for these species and as such the hatchery and the benefits it provides are more secure over the long-term.

Page 5 and 6. Risks: Add to this list of changes in phenotypic characteristics between the wild spring Chinook and the hatchery fish. In an earlier letter to the FWS (See attachment 1). Mr. Diggs (U.S. Fish and Wildlife Service) published an article that indicated a divergence in the phenotypic traits of the hatchery stock when compared to the wild Chinook including larger hatchery juveniles, earlier adult run timing, younger age at adult maturity, spawning timing, and a difference in fishery contribution. Since phenotypic traits can over time result in genetic divergence, changes in phenotypic traits should be a serious concern. By not including divergence in phenotypic traits in the risk category and showing how these will be addressed in the recommendations section is a major shortfall in this assessment.

Page 6. Ecological Risks: I am pleased that hatchery effluent is addressed; however, it is important to address the release of pathogens into receiving waters so that the hatchery does not function as a point source for pathogens in the Warm Springs and Deschutes rivers. Also, this risk statement should indicate that DEQ criteria for hatchery effluent are the standard by which the hatchery is in compliance with the Clean Water Act.

I am very pleased with the risk discussion about the potential problem of disease resistant pathogens being created by the use of antibiotics. This problem has been of increasing concern in human health and should be no less important in fish culture. This risk should be identified as a research and management priority.

Another risk should be included in this list. The risk associated with cost and funding for this hatchery operation should be included. Obviously, given the short-fall in federal funding for natural resource and other domestic agencies, the assessment should recognize this risk and discuss options. If funding for this facility, research, and management were to occur, what impact would that likely have on not only the hatchery product, but the conservation of wild spring Chinook and summer steelhead in the Deschutes Basin?

The risk assessment should also evaluate costs of the hatchery program such as the cost to catch of Chinook produced for harvest. In the Columbia River basin, some hatchery fish cost over $891,000 per fish caught in the fisheries (IEAB 2002). A cost analysis of the Warm Spring Hatchery is needed to determine the value of its contribution to fisheries, its stated goal. As Mr. Diggs pointed out in his assessment of this hatchery, the wild Chinook contributed to more fisheries over a wilder geographical area than the hatchery stock (attachment 1). Since fishery contribution is included as a value in your goal statement (page 1), an assessment of contribution to fisheries and the cost of that contribution is required in this assessment.

Page 9. Conservation: The assessment states that “Sustainable natural production of trout, salmon and steelhead is an important fisheries goal…” the term sustainable should be defined so it is clear what the goal actually means. I would also include a definition of what a sustainable hatchery population and production means.

Page 10. Third paragraph: The assessment states: “The White River supports natural populations of rainbow trout and other native resident fish.” This population of resident rainbow trout has been identified as a unique form of rainbow that is very unlike other Deschutes Basin rainbow trout. This has been verified in a genetic evaluation and reported by ODFW. Due to this uniqueness, the state stopped planting hatchery rainbow trout above White River Falls and a proposal by the Warm Springs Confederated Tribes to release salmon and steelhead above the falls was rejected. The assessment should more fully describe this unique rainbow trout. Dr. Schreck should be able to expand this part of the assessment using the genetic work conducted by Ken Currens.

Page 11. Table 1 Round Butte Hatchery spring Chinook: This table does not include the origin of Round Butte Hatchery spring Chinook. It is my understanding that due to poor survival of Round Butte Hatchery spring Chinook originally derived from Metolius River stock, that the hatchery stock was re-established with Warm Springs Hatchery Chinook. The origin of a hatchery stock should be included in all tables discussing hatchery stocks.

It is assumed in all tables in this document that harvest, hatchery output and natural production numbers will be increased. The assessment should discuss these assertions in terms of a place holder in reality and the potential impact of increased hatchery production and harvest on wild populations in the Deschutes Basin. Otherwise the assessment contains an optimistic forecast that is inadequately evaluated.

Page 12. Table 2 Deschutes Fall Chinook: This assessment by co-managers rates the wild fall Chinook as of medium to high biological significance. Isn't obvious that this population is of high biological significance? How many wild fall Chinook populations are there above Bonneville Dam that are as productive as the Deschutes population? Hanford Reach?

Page 12. Table 3 Summer Steelhead: The biological significance of this population is rated medium now and into the future. I do not understand the rating rationale. To me the summer steelhead is of high biological significance and the threats from stray hatchery fish and habitat degradation, primarily on east side tributaries, is a high priority to be fixed. I suspect that if anglers on the Deschutes were asked they would give a different answer from that of the co-managers, saying that wild summer steelhead are of high biological significance. This rating is probably related to the high stray rate from out-of-basin hatchery steelhead. Many of these strays come from U.S. Fish and Wildlife Service funded hatchery programs. I assume that if this assessment process will clean up this stray steelhead problem, therefore the wild steelhead significance should increase. This rating should be changed to reflect some of what we accept as reality.

The viable rating in this table is confusing. The co-managers consider the steelhead viable even though it is an ESA-listed species and there is information that some populations are not viable. I would have to conclude that this table is not a viable representation of steelhead. The tables seem to be more concerned about increasing production and catch (management goals) than they are in accurately describing the biological status of and risks to each population reviewed.

Page 13. Table 4 Round Butte Hatchery summer steelhead: The table says that 125 adult steelhead are needed for hatchery broodstock but the average annual return of hatchery steelhead to the hatchery is over 750 fish. This would indicate that the contribution rate for these hatchery steelhead could be higher. The goal of this hatchery is to produce fish for the fishery and excess fish do not contribute to this fishery.

Page 20. Conservation: Hatchery spring Chinook from Warm Springs Hatchery are released into Shitike Creek. I assume that the genetic and life history analysis of these two populations support this transfer. Since the Warm Springs Hatchery spring Chinook have diverged from the wild spring Chinook in the Warm Springs River in life history traits and in survival rates, releases of these hatchery fish in Shitike Creek would be inconsistent with a conservation goal to maintain the wild Shitike Creek spring Chinook. What is the scientific basis of this stock transfer program and how is it consistent with conservation of the last two wild spring Chinook populations remaining in the Deschutes subbasin? This comment would apply also to the conservation benefits identified on page 21 for Shitike Creek.

Page 21. Conservation: Removing marked stray hatchery steelhead at the Warm Springs Hatchery weir is a definite benefit for wild steelhead conservation in the Deschutes basin. This program is important since the Warm Spring River is the only tributary that has maintained a long term gene flow barrier by excluding stray steelhead in the basin. However, as Hand and Olsen (2003) noted in their paper, unmarked steelhead strays represent a substantial risk to the conservation management goal for the Warm Springs River wild steelhead. They make two recommendations: 1) a comprehensive coded wire tag program in the Columbia River Basin hatchery programs so that stray hatchery fish can be identified at the Warm Spring Hatchery and the hatchery of origin can be determined. 2) mark all hatchery steelhead released in the Columbia River basin to allow Warm Springs Hatchery workers to exclude strays from the river above the hatchery. Given these concerns, the conservation account presented in the assessment is incomplete and should reflect the above issues. In addition, the evaluation of the Warm Springs Hatchery in this assessment must be made in a broader context than just the Deschutes Basin. It must be viewed in context of the whole Columbia River Basin since the fish released from the Warm Springs Hatchery have an impact on and are affected by management in the Columbia River Basin. This includes predator attraction, strays, harvest impact, contribution etc. in the Columbia Basin.

Page 22. Risks to other non-target species: The assessment does not clearly display the impacts to migrating resident rainbow and bull trout moving up stream form the Deschutes River into the Warm Springs River. Does the hatchery weir block the access of these species to the upper Warm Springs River? Other species that may be blocked besides lamprey are the native sucker using the Warm Springs River as a spawning and rearing stream. These issues should be addressed in this assessment for both Shitike Creek and the Warm Springs River.

Page 23. Recommendations:

WS1a and WS1b: These two recommendations seem to be responding to the same issue but with different values. One calls for natural origin fish to be represented in the hatchery brood stock at the 10% level and the other calls for a 5% mix.

It appears that this plan is proposing a deliberate passage of hatchery spring Chinook into the Warm Springs River above the hatchery weir for natural spawning. The risks of allowing this interaction, given the stated divergence in the hatchery population (Diggs 1995) should be evaluated in this assessment. Inadvertent and purposeful passage of hatchery fish already happens periodically now. Will this passage of hatchery fish now be provided official sanction through this assessment, calling it the "sliding scale?" What is the scientific basis for this decision and the risks associated with it. Given the uniqueness of a wild spring Chinook population in the Warm Springs River, it seems passage of hatchery origin fish, for whatever reason, carries a high risk to the wild population. This has to be fully explained.

Page 24. WS8: On my most recent visit I found painted raceways but the fish were starved for shade, using the thin shadow provided by the raceway wall on one side. This concentrated the fish into a very small space and they were speaking quite loudly that more shade is needed to make the raceways a more benign environment.

WS10a: The assessment calls for a plan to provide better protection for hatchery smolts from predators that are staged at the hatchery release outlet. I do not know how this can be accomplished but I do not support the elimination of predators. Perhaps more training is needed so the hatchery fish are more aware of predators. Survival rates for hatchery spring Chinook, naturally rearing in the Pelton Fishway, increased when the fish food was reduced (encouraging natural feeding) and predators (Great Blue Herons) were allowed to work the fish (Don Ratliff, personal communication). Maybe the predation problem is fixed in the hatchery environment rather than in the river after the hatchery fish are released.

Page 25. WS15: I agree with this recommendation (and most of the others). The Warm Springs Hatchery should not be used to rear Round Butte Hatchery spring Chinook or any other non-indigenous Warm Springs River salmonids.

WS16: Kelt reconditioning research is fine and I have supported this work on the Yakima River. However, this research should take the next step and determine the reproductive success of reconditioned kelts.

Page 26. Alternatives to the existing program: I agree with the authors of this assessment regarding the alternatives proposed. None of these alternative should be advanced to the operational stage.

Thank you for this opportunity to provide comments on the important hatchery assessment. On the whole I think this assessment represents progressive thinking and a sound science based approach to the issues related to native salmonid conservation management in the Deschutes and Warm Springs basins.

Sincerely,

Bill M. Bakke, Director

References

Hand, David and Doug Olson, December 2003. Steelhead Returns to Warm Springs National Fish Hatchery, 1978-2003. U.S. Fish and Wildlife Service. Columbia River Fisheries Program Office. Vancouver, Washington.

Independent Economic Advisory Board. 2002. Artificial production review economics analysis, phase I. N.W. Power Planning and Conservation Council. IEAB 2002-5. Portland, Oregon. http://www.nwcouncil.org/library/ieab/ieab2002-1.htm

Attachment 1

NATIVE FISH SOCIETY

P.O. Box 19570
Portland, Oregon 97280
(503) 977-0287
Email: bmbakke@qwest.net
http://www.nativefishsociety.org/

October 22, 1995

Daniel H. Diggs
U.S. Fish and Wildlife Service
911 N.E. 11th Avenue
Portland, OR 97232

RE: Comments on: Use of a national fish hatchery to complement wild salmon and steelhead production in an Oregon stream

Dear Mr. Diggs:

I read with great interest the work you co-authored on the Warm Springs Hatchery. This is the first evaluation of this hatchery that I am aware of that has gone through peer review. I would recommend that a mechanism be developed by the Service to provide additional peer review of this project.

Based on this research report, I have a few observations. To begin, I do not agree with your conclusion that the hatchery is not having an adverse effect on wild stock production. I do not believe you know if it is or is not having an effect given the uncertainties noted in the study and the divergence of the hatchery spring Chinook form the wild spring Chinook in the Warm Springs River.

The study does not present information regarding the smolt to adult survival rate of hatchery and wild spring Chinook. Is there a difference between these two populations?

The study remains silent on the potential effects of disease treatment of hatchery fish resulting in the creation of resistant pathogens. It is assumed in fish culture that disease treatment will have no effect on pathogen evolution, but we know from human health studies that resistant pathogens are a reality and are the product of disease treatment. Why is fish culture not looking at this issue? What would be the effect of resistant pathogens on the wild stock in the same system? Could you explain what the Service is doing to address these questions and the potential problem of pathogen resistance?

The study assumes that optimum escapement and juvenile production should be an operational goal for wild spring Chinook, but in doing so the authors ignore the fact that the tremendous fecundity of salmon is an evolutionary response to constantly changing environments from the freshwater natal streams to the productivity of the ocean. Salmon have evolved to maximize the number of spawners. This results in a tradeoff in terms of juvenile production. If by maximizing adult spawning there is a cost in terms of juvenile production, then what is the underlying survival advantage? There are two obvious values the authors overlooked. One is that by increasing the abundance of spawners there is a large infusion of nutrients to the system that is available to the next generation of juveniles in the form of aquatic animal production. The second value is one that is often overlooked in industrial fish management. That is the exchange of genetic information. By having lots of spawners the exchange of genetic material is increased and available for natural selection.

This genetic value would mean each brood class would have the capacity to solve problems a variable environment presents on an annual and longer-term duration. The safety valve, if you will, is compensatory response to low spawner density, that is, increased survival of juveniles. This compensatory mechanism is a survival strategy that compensates for high adult mortality. However, the study would indicate that management of the wild run at the compensatory level of abundance is the preferred policy. I disagree, because the policy is aimed at production rather than the evolutionary health of the wild stock. The policy also advocates for lower ecological nutrient budget in the river. It was disappointing to see the authors not explore these issues and fail to frame a research response to address them.

The study mentions a difference in contribution and behavior between hatchery and wild cohorts, but fails to elaborate as to the detail of those differences and the steps the hatchery operation may take to reduce those differences.

The study states that hatchery juvenile spring Chinook are larger at release than wild juvenile Chinook. This is a serious problem that has been documented in the scientific literature, yet the study only states that you "may want to experiment with size at release..." Larger juveniles have a competitive advantage over smaller juveniles and while there is documentation, which you cite, that larger juveniles pull the smaller ones downstream, you do not mention that the predator response is selective for smaller juveniles. The hatchery is mimicking the outmigration timing of the wild spring Chinook, but it is releasing a fish that has a competitive advantage, attracts predators, and sets the wild and smaller juvenile up for selective mortality. This I would suggest is a large problem that must be addressed.

The study documents numerous changes in the hatchery product but minimizes the importance of those changes in its concluding statement that the hatchery is not adversely affecting the wild spring Chinook. The divergence noted in the study between the hatchery and wild populations in the Warm Springs River are serious and should be addressed. I will recount the changes the study notes:

1. The hatchery Chinook are predominately age 3 adults while the wild Chinook are age 4 and 5 adults. This is a typical age structure change seen in hatchery fish, but it is also advance warning of numerous problems. The wild population is composed of larger and older adults for a reason important for their survival. We know that larger adults carry more eggs and they can spawn in coarser substrate. These are important values that should not be minimized.

2. The wild fish contribute to more fisheries over a wider geographic area than to hatchery fish. This should be of great concern to the Service given its industrial approach to hatcheries and emphasis on commodity production. This result of the hatchery should cause fishermen and women to be greatly concerned because they have less access and smaller fish for their effort. The dockside value of a five year old Chinook compared to a three year old one must be of great importance to the fisher. The unstated assumption in the study is one that smaller Chinook contributing primarily to Deschutes River fisheries is better than a large Chinook that contributes to ocean, mainstem, and Deschutes fisheries. I would suggest that this assumption is leading to a diminished catch and lower economic value from the hatchery product.

3. Hatchery juveniles are larger and have a greater length frequency distribution than do wild Chinook juveniles. This should be of great concern to the Service given the reasons stated above about competition and predation problems created for wild Chinook.

4. Adult run timing is one to three weeks later than for wild Chinook. This divergence in run timing is an indicator that the two populations are diverging and should be addressed for what it is an early warning that greater problems are likely to materialize.

5. Spawning time divergence is brushed over lightly, but should be investigated to determine whether it is happening or not. It is critical to make sure that the wild and hatchery populations do not diverge in

terms of life history traits such as spawning and run timing. The risk of such changes can have a direct adverse effect on the viability of the wild population.

It is important to address life history divergence between the hatchery and wild Chinook. It is clear that changes are taking place and must be corrected. Based on this study, the authors cannot say with any certainty that the wild Chinook are not or will not be adversely affected by the hatchery Chinook in the system. I am disappointed in the AFS peer review process, if in that review, these issues were not brought out.

But I am pleased the Service has finally evaluated the Warm Springs Hatchery in a peer reviewed context after so many decades of operation. The study points out some important concerns and research needs. I would only suggest that more attention be given to the issues I have raised in future research and hatchery operation planning.

Sincerely,

B.M. Bakke

cc: Paul Brouha AFS, Warm Springs Tribes, ODFW, NMFS

Attachment 2

NATIVE FISH SOCIETY
P.O. Box 19570
Portland, Oregon 97280
(503) 977-0287
Email: bmbakke@teleport.com

January 30, 2004

Rob Jones
National Marine Fisheries Service
525 NE Oregon Street
Suite 500
Portland, OR 97232

RE: Review comments on the Warm Springs Hatchery HGMP

Dear Mr. Jones:

Thank you for sending a copy of the Warm Spring Hatchery draft Hatchery and Genetic Management Plan. I have a few comments on this HGMP.

The Warm Springs National Fish Hatchery HGMP is an augmentation hatchery for spring Chinook. The working concept for this hatchery including its annual operation plan and research program are driven by the goal of wild spring Chinook conservation and is integrated with conservation management other native species such as the ESA-listed summer steelhead. The hatchery is designed and operated to work within the ecosystem with the purpose of minimizing impacts on all species affected by hatchery releases and returns. A research program has been created to improve the understanding of the hatchery effect on the system it operates within.

Of the hatchery HGMPs I have reviewed, and there seem to be thousands of them, this by far is the most biological sound operation. It should be a prototype for other hatcheries in the Columbia River Basin and elsewhere, because it, like most of others, is operated to increase the number of fish for harvest. The difference is, and this is the grand experiment, the hatchery is operated so that it does minimal harm to the wild salmon and steelhead. This hatchery sets a high standard that should be used to shape the Columbia River hatchery program.

The following comments are aimed at improving this hatchery program.

1. The incidental take of listed species for all hatchery related operations including research and monitoring programs should be calculated.

2. The release of 750,000 spring Chinook smolts annually should be evaluated for its impact on wild spring Chinook and other species that may come into competition with presmolts and smolts. How does this release compare to the estimated spring Chinook abundance in the past? How was this release target developed? Was it an enhancement target or does it fit into a biological context? My concern is that there may be a biological cost coming from the size of this release on listed steelhead, wild rainbow.

3. The research program should evaluate the biological effect of placing salmon carcasses in the Warm Springs River to determine the benefit and response from natural populations. This could be an important contribution to the growing number of scientific evaluations on nutrient enrichment of streams.

4. A timetable should be displayed for the replacement of water intake screens that will meet NMFS requirements.

5. Display the divergence of life history traits between hatchery and wild stocks and develop a plan for minimizing this divergence.

6. Establish smolt development indices.

7. More research could be done to rear spring Chinook in more natural environments.

8. Research: Evaluate ways to reduce divergence between hatchery and wild spring Chinook and provide ways to better control domestication selection in the hatchery.

9. In order to maintain the integrity of this hatchery program, a comprehensive coded wire tag program for all hatchery released fish should be developed for the Columbia River Basin. This will help identify the origins of hatchery strays.

10. In order to maintain the integrity of this hatchery program and listed steelhead, all hatchery released steelhead in the Columbia River Basin should have an external mark and contain a CWT. (See Hand and Olson 2003 for details).

I also spoke to ODFW biologists about this hatchery. I was especially interested in what those who have to work directly with the effects of this hatchery in the Deschutes Basin had to say. I learned from them that this hatchery is operated well and has a research program designed to answer questions. From their perspective this hatchery is fine, but other hatcheries are creating problems. They are encountering large numbers of unmarked hatchery strays into the Deschutes River. Based on ODFW data, 50% of these strays leave the river, however, this means that from 2,000 to 13,000 hatchery strays remain in the river to spawn. At Warm Spring Hatchery there is a weir and trap so that all fish can be examined. Hand and Olson (2003) said that 87% of the hatchery fish that could be identified were from Irrigon Hatchery, however, 63% of the fish that were intercepted at the weir could not be traced to a particular hatchery because they did not contain a CWT. ODFW has said that they also get high stray rates form Salmon River, Idaho releases and from Hells Canyon Dam releases. These out-of-basin steelhead strays are causing serious problems for subbasins these stray fish go into. The ODFW biologist for the John Day is also reporting high hatchery fish stray rates into a river that has been designated a wild salmon and steelhead management stream.

In order to maintain the high standard of hatchery operation and the integrity of listed steelhead in the Warm Springs River, the operation of this hatchery must be viewed in the context of effects from other Columbia Basin hatcheries. Two factors important to the operation of this hatchery were identified by Hand and Olson (2003) where they called for a comprehensive CWT program so hatchery origin strays can be traced to their hatchery of origin, and a 100% external mark for all hatchery steelhead released into the Columbia River Basin. By marking all hatchery steelhead, it would assist the hatchery workers to make sure only wild steelhead are passed upstream for natural spawning.

Sincerely,

Bill M. Bakke, Director

Reference:

Hand, David and Doug Olson. December 2003. Steelhead Returns to Warm Springs National Fish Hatchery, 1978-2003. U.S. Fish and Wildlife Service. Columbia River Fisheries Program Office. Vancouver, WA.

VIA EMAIL

February 17, 2006

Doug DeHart
USFWS
911 NE 11th Ave.
Portland, OR 97232

RE: Columbia Basin Hatchery Review Information

Dear Doug:

Thank you for the opportunity to comment on the U.S. Fish and Wildlife Review's draft Columbia River Basin Hatchery Review Team's Assessments and Recommendations for the Warm Springs National Fish Hatchery. We are very grateful for the efforts that the USFWS has made to involve Trout Unlimited (TU) in the ongoing review of the Columbia Basin Hatcheries, including the many preliminary conversations and opportunities to visit the facility.

As you know, Trout Unlimited has an extensive program dedicated to hatchery reform, including the promotion of the "landscape concept" based on Williams et al. (2004), compliance monitoring pursuant to the Endangered Species Act (ESA), the National Environmental Policy Act (NEPA), and recovery needs of threatened and endangered salmon and finally, as a mitigation requirements pursuant to FERC licensed facilities. As a result of this program and your outreach, we have had many opportunities to visit the Warm Springs National Fish Hatchery. We believe it ranks as one of the top hatcheries in the region and certainly among the best of the USFWS hatcheries. Nonetheless, we have yet to find a "perfect" hatchery that meets all of its stated goals, our landscape model, and is in complete compliance with the ESA, NEPA and recovery requirements. Although the Warm Springs National Fish Hatchery stands out among its peers, we believe that all hatcheries, including Warm Springs, can be improved.

The draft Columbia River Basin Hatchery Review Team's Assessments and Recommendations for the Warm Springs National Fish Hatchery is a laudable first step towards the improvements needed at the hatchery. We offer the following comments to USFWS on that document. We apologize that our comments are not as extensive as they would have been if we had more time to review the document, and indeed, answers to some of our concerns may be imbedded in some supporting documents that we were unable to read during the review period.

II. Components

The report states that it is “based upon the best scientific information available at the time of the review.” Yet the description of the watershed, goals, stock status and hatchery program ignores all of the best available science in the Interior Columbia Technical Recovery Team’s (TRT) analyses, the State of Oregon’s stock status assessment pursuant to the state Native Fish Conservation Policy, and the numerous investigations and studies done pursuant to the Pelton-Round Butte FERC relicensing process, instead relying on the AHA model and agency “estimates” of stock status and habitat quality, including estimates of management objectives. Unlike the HSRG, the federal agencies operate under a different mandate that includes an affirmative duty to recover listed threatened and endangered salmonids. 16 U.S.C. § 1533(f). To that end, the USFWS is bound by the federal recovery process in the region that revolves around scientific recovery parameters developed by the TRT, even for species not listed under the ESA. That is not to say that the agencies cannot consider additional information and data, nor consult with the other co-managers in evaluating the watershed conditions, but to outright ignore the TRT data and rely on a completely different model raises significant questions and gives the appearance that the USFWS is avoiding their own mandates, even though spring Chinook are not a listed species under the ESA. We therefore agree with the comments raised by NOAA Fisheries and do not believe the draft report provides an acceptable response. It is therefore very difficult to agree that this report is based on the best scientific information available at the time of the review.

Instead the draft report relies on the AHA model, but fails to explain why it chose the AHA model, what the advantages and disadvantages are to the model, the assumptions underlying the model and other alternatives. As a result, it is very difficult to comprehend the tables in the report produced by the application of the AHA model. We would highly recommend adding keys to the graphs as well as titles for the x- and y- axes. The information contained in footnote 11 is not only confusing but not very reader friendly. The tables and graphs also need to be enlarged to provide better accuracy in reading the numbers and conclusions. While the input tables are provided in Appendix B, there is very little information explaining the parameters, the source of the data, or why there is a complete dearth of information on the status of the wild population that can otherwise be found in any of the other sources listed above.

It is also disturbing that the model relies heavily on professional opinion and not best available science. The spuriousness of this approach is seen in Table 3 under population viability where the AHA model relies on co-manager’s conclusions that the “stock is viable, although it is listed as threatened under the ESA, and recent viability analysis for recovery planning suggest that some populations may not be viable.” NOAA Fisheries also commented on this inconsistency and instead of resorting to scientific information, the USFWS report falls back on professional opinion from fisheries managers. The inability of managers to accurately gauge the status of populations has resulted in the listings of 26 salmon and steelhead in the region. This Pollyanna approach in the face of scientific data to the contrary highlights one of the shortcomings of the AHA approach.

Similarly, this reliance on professional opinion is very concerning when it applies to outlining the goals of the programs and watershed management priorities. The report never asks the question whether the goals for the basin, including the hatchery, are appropriately matched for the watershed itself and if the hatchery is the appropriate management action to accomplish those goals. One of the primary questions any review should ask is what are our goals, and what would the natural environment provide in the absence of this hatchery. From there, the managers should look to the hatchery if it fills those goals but not at the expense of the function of the natural system. This report presumes that the management goals are appropriate for the watershed and that the hatchery satisfies those goals. We agree that the hatchery is serving the goals, but we are disappointed that the reviewers didn't take one step backwards and ask if the hatchery was the right tool, and if so, how can the hatchery be operated in a way that doesn't impact the natural ecosystem function. One reason we do not think the report addressed these questions is because it fails to look at the comprehensive and cumulative impact of the hatchery. Admittedly this is very difficult to address on a hatchery by hatchery basis, but the report even fails to include a placeholder for this analysis or direct the reader to other more comprehensive reviews ongoing in the basin. For example, an obvious but unmentioned bottleneck for the hatchery production is the Columbia River estuary. How does the report look at the factors limiting wild fish viability and recovery, as well as the efficiency of the hatchery production? There is simply no analysis of the downstream effects of the hatchery production on the wild population and no discussion of the monitoring and evaluation, with the exception of its costs, that is taking place upstream to demonstrate the minimal impact. There is no evidence that genetic testing is being done upstream and downstream, or evaluations of phenotypic changes, behavioral differences, habitat uses etc. Nonetheless, on pg. 19, the report claims that the siting of the hatchery minimizes the likelihood of adverse ecological interactions because it segregates hatchery and wild spawners. But this only reflects on small aspect of the life history and the potential ecological interaction between the two stocks. We believe that many of the management decisions are minimizing potential risks, but there is a presumption that those management decisions are enough, without actually looking further at the data.

Furthermore, the model uses a different approach to viability than that adopted by NOAA Fisheries and the region in the Viable Salmonid Population (VSP) concept (McElheny et al., 2000). The VSP criteria offer a much more robust, metric based analysis that uses more than the few factors considered by the AHA model, and focuses on self-sustaining populations in the wild (as does the state of Oregon's Native Fish Conservation Policy). Therefore, it is difficult to understand or even gauge the value of applying the concepts of "biological significance" and "population viability" to pure hatchery stocks such as the Round Butte Hatchery spring Chinook (an identified segregated stock). The application of the terms significance and viability to these hatchery stocks seems to contradict both the best available science as well as state law. At the very least, the report should explain its reasoning for relying on the AHA model over the VSP model and the differences between the two, especially in terms of the metrics evaluated or not.

Other model concerns revolve around the metrics. Simple recruit curves and mean adult returns fail to capture the spatial and temporal distribution and habitat measures that support the distribution, as well as the genetic and life history diversity that is critical to salmon survival and recovery. (Zabel et al., 2006). Measures of capacity and productivity as proxies for habitat quality do not capture the habitat potential necessary for viability and recovery. Productivity and capacity are measures easily transferred to the hatchery environment (indeed the explanation of AHA does not explain if the viability modeling applies to the hatchery or naturally spawned populations) which in effect perpetuates the status quo of a hatchery by arguing that it is capable of a high productivity at a sustained output. This approach fails to capture the selective pressures and environments that result in the long term evolution of salmon and their ecosystem function that would be captured by looking at direct measures of habitat, such as quality (flow, temperature, gravel deposits etc.) and accessibility. Unlike the VSP criteria, the AHA model does not explain how it is sensitive to future changes in conditions, such as habitat changes, ocean conditions, or global warming, nor does it measure the ability of the stock to sustain itself over time, as required by the recovery criteria of the ESA, which binds the agency. At the very least, the report should provide an explanation for the deviation.

III. Assessments

A. Description of the program

We would like to see more description of the current hatchery program, especially the monitoring and evaluation, as well as how well the current hatchery is meeting its goals (for example, how close are they to the 0.3% juvenile to adult survival rate at the mouth of the Deschutes River?). We believe that all of the components of the description are otherwise there, but just need further elaboration in the report itself. For example, in the spawning, what is the ratio of male to females (i.e. how many males fertilize how many eggs?), and what is the rationale behind the different ages at time of release?

Under the description of Broodstock Choice/Collection, Hatchery and Natural Spawning, we are confused about the statement "hatchery adds considerable capacity to the natural habitat, but not necessarily increased productivity." While the hatchery may produce as many fish as the natural habitat, it does not increase the function of the habitat (i.e. double refugia, prey sources etc.), so we find it difficult to understand how the hatchery adds "capacity" but not necessarily increased productivity. Please explain this statement in more detail. Also, this entire bullet would be better displayed as a table instead of text.

The AHA model also demonstrates limitations in the analysis of benefits and risks. The analysis of benefits and risks appears to be very focused "inside the hatchery fence" and not towards the overall landscape. For example, the genetic and demographic risks do not look at the risks of the hatchery production on the life history changes, morphological changes or other behavioral changes that may result from hatchery fish spawning with the wild population. (Einum and Fleming, 2001, Heath et al., 2003). Similarly, the ecological risks do not consider, except in very broad terms, the effect of more than twice the outgoing smolts and returning adults in the migratory corridor, such as added stress through habitat bottlenecks, limited refugia, attraction of predators and limited carrying capacity. We applaud the thoroughness of the ecological risks in their consideration of inter-species impacts and non-target watershed impacts.

B. Benefit and Risk Analysis

We agreed with many of the statements regarding the various benefits and risks associated with the program, but would have liked to see the rationale and data behind the analysis. We support and appreciate the analysis of benefit and risks to non-target stocks and species in the system. There are however, some conclusions that we find confusing.

For example, we take issue with attributing a conservation benefit to the hatchery because it provides the opportunity to screen and treat adults and carcasses (presumably of hatchery fish), but this wouldn't be a benefit if there wasn't a hatchery in the first place. Thus, instead of being a "benefit" it is better suited as a minimization of risk. Similarly, we find it difficult to attribute a strong demographic buffer or genetic repository benefit to the hatchery. For one thing, it would be much cheaper, and much more effective in maintaining diversity, to simply take a genetic sample from each wild fish and cryopreserve it. Similarly, while the hatchery may serve as a "safety net" for the wild population in the face of a catastrophe, it has the opposite effect of pulling out the most suitable fish to survive the environmental stochasticity. Indeed, at some point in the face of catastrophic events, it makes sense to take all of the wild populations out of the habitat and institute a captive broodstock program, but that is not analyzed here, nor is it one of the purposes of the hatchery. Thus, any demographic buffer is minimal and balanced by the "hand of god" approach to natural selection that may actually hurt the overall viability of the population more than if the fish were allowed to spawn, even unsuccessfully, upstream. Finally, we agree that there is a potential conservation benefit of fish being planted in Shitike Creek, but believe that all of the "potential" benefits and risks should be separated an placed into a section on monitoring and evaluation instead of counting equally with known benefits and risks. By adding them, without explanation and a corresponding monitoring, evaluation and adaptive management program (see comments below), to the benefit and risk analysis gives the appearance of "padding" the contribution or impact of the hatchery.

We also believe that there should be a section on the risk posed by the hatchery program to the wild population. The section on the risk to the "target stock" is confusing because it moves between risks to the hatchery stock, such as domestication, and the risks to the wild stock. They should be separated. This is especially true under the "genetics" where there is very little discussion of the risks of the hatchery stock passing upstream and spawning, or any lack of genetic monitoring associated with that risk. Similarly, some of the risks outlined under "demographic" are also genetic risks if they are applied to the wild stocks. For example, the risk of removing wild fish for broodstock, even as low as 5%, imparts a genetic risk by shirking the effective population size (Ne), the genetic diversity of the species and possibly life history diversity and spawning distribution. There are also additional predatory risks, aside from the demographic risks of concentrating predators at release locations, such as downstream effects at the smolt life stage, that should be included.

Finally, we believe that there is a major discussion on risks that is missing under the "ecological risks" associated with the hatchery program on the target stock. The AHA model estimates that the upriver carrying capacity is roughly 2,000 adults, yet the average returns have been 1,338 adults. Why is it that the population is viable, but yet not nearing carrying capacity? If we read the information correctly, the adult-adult returns for the hatchery stocks are 4.3 while they are 3 for the wild stocks. If that were the case, the wild stocks should be improving dramatically, but that is not the case. Similarly, there would be a huge surplus at the hatchery. Why is it that the hatchery recruits are doing that much better than the wild stocks? Have the wild stocks been depressed by the hatchery releases, either by competition, predation, introgression or other factors? Have the long term releases of the hatchery stocks changed the wild population to such an extent that it may not reach capacity? What kind of monitoring, especially genetic, is occurring to evaluate these risks? These questions should be captured in some form under the risks discussion as well as a discussion on monitoring and evaluation.

C. Monitoring, Evaluation and Adaptive Management

The report should include a description of the ongoing monitoring and evaluation. For example, what monitoring and evaluation is currently occurring for the differential age releases, the accidental escapement of hatchery origin Chinook onto the spawning grounds, the effectiveness and impacts of the planting of hatchery Chinook in Shitike Cree and why the up river habitat seems consistently below capacity?

The report also states that "in keeping with the tenets of adaptive management, it will be necessary to review and adapt these recommendations as new scientific information becomes available and/or goals change." However, the recommendations include research, monitoring and evaluation of conditions. The results of those recommendations automatically require a corresponding adaptive management program if the actual research, monitoring and evaluation are meaningful. For example, the current protocol plants hatchery fish into Shitike Creek but there is no description of corresponding research and monitoring and adaptive management that responds to the data collected. Delaying the development of an adaptive management plan, has historically resulted in perpetuation of poor practices. Inclusion of the monitoring and evaluation as well as an adaptive management recommendation would overcome these concerns.

IV. Recommendations

We agree with many of the recommendations and believe, based on the issues raised above, that there can and should be additional recommendations. We also question the binding nature of the recommendations? In other words, can USFWS simply ignore the recommendations? We would like to see a discussion of the next steps to incorporate the recommendations to that they do not gather dust on a bookshelf.

As discussed above, we would like to see a much more detailed section on monitoring and accountability. We found many areas, such as outplanting in Shitike Creek, the downstream effects between the hatchery and wild stock, and the other "potential" risks identified in the report, that should be included in the monitoring and evaluation section. We do agree with the recommendations included.

Finally, we agree with the recommended alternative at this time, but would suggest that additional review and data are needed to better support the recommended alternative, as described above in our comments.

Thank you for your consideration of our comments. We look forward to continuing our interactions with USFWS in the ongoing review process for the Warm Springs Hatchery as well as the other USFWS hatcheries in the Columbia Basin. Please do not hesitate to contact us if you have any questions or concerns about our comments.

Respectfully submitted,

Kaitlin L. Lovell, Esq.

Kaitlin L. Lovell

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Pacific Region Fishery Resources
911 NE 11th Avenue
Portland, OR 97232
503/872.2763
E-Mail: Douglas_dehart@fws.gov

U.S. Fish and Wildlife Service
www.fws.gov

For Columbia River Basin Hatchery Review Information
www.fws.gov/pacific/Fisheries/Hatcheryreview/

The mission of the U.S. Fish and Wildlife Service is working with others to conserve, protect and enhance fish, wildlife, plants and their habitats for the continuing benefit of the American people.

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