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ENTIAT HATCHERY

A COMPILATION AND SUMMARY OF  
IHOT AUDIT FOR SPRING CHINOOK

JULY 1998

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**HATCHERY EVALUATION REPORT  
SUMMARY FOR**

**Entiat NFH  
- Spring Chinook**

**A Summarized Compilation of Independent Audits Based on  
Integrated Hatchery Operations Team (IHOT) Performance  
Measures**

**SUMMARY REPORT PREPARED BY:  
DON SAMPSON  
SAMPSEL CONSULTING SERVICES  
FOR THE  
NORTHWEST POWER PLANNING COUNCIL  
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Original IHOT Audit Reports Prepared by:

Montgomery Watson  
2375 130th Avenue NE  
Suite 200  
Bellevue, WA 98005  
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## Executive Summary

This report compiles a summary of the findings of the Hatchery Evaluation Reports for Spring Chinook at Entiat Hatchery. The original Hatchery Evaluation Reports, prepared by Montgomery Watson, presented each species and program separately and include the complete findings. Details on the audit compliance status for each species and program are included in the original reports. The Hatchery Evaluation Reports were based upon audits conducted in 1996-1997 as part of a 2-year effort that will include 67 hatcheries and satellite facilities located on the Columbia and Snake River system in Idaho, Oregon, and Washington. The hatchery operating agencies include the U.S Fish and Wildlife Service, Idaho Department of Fish and Game, Oregon Department of Fish and Wildlife, and Washington Department of Fish and Wildlife.

Entiat NFH is located along the Entiat River, east of Entiat, Washington. The facility is operated as a satellite of Leavenworth NFH by the US Fish and Wildlife Service. The hatchery is used for adult collection, incubation, and rearing of spring chinook.

### Background

The audit is being conducted as a requirement of the Northwest Power Planning Council (NPPC) “Strategy for Salmon” and the Columbia River Basin Fish and Wildlife Program. Under the audit, the hatcheries are evaluated against policies and related performance measures developed by the Integrated Hatchery Operations Team (IHOT) in January 1995. IHOT is a multi-agency group established by the NPPC to direct the development of new basinwide standards for managing and operating fish hatcheries. The Bonneville Power Administration (BPA) contracted with Montgomery Watson to act as an independent contractor for the audit.

IHOT has established five basic policies that cover: (1) hatchery coordination, (2) hatchery performance standards, (3) fish health, (4) ecological interaction, and (5) genetics. The audit focuses on all these policies, with the exception of hatchery coordination. These policies are set forth in *Policies and Procedures for Columbia Basin Anadromous Salmonid Hatcheries (IHOT 1995)*, which is the source for the performance measures that are the basis of this audit.

### The Audit Process

The audit was based on the facility management’s response to a 109-page questionnaire. This audit form was completed through a five-step process in which:

- Information was obtained from headquarters.
- The hatchery manager was asked to fill out and return the audit form.
- A 1-2 day site audit visit was conducted to inspect facilities, review hatchery records, discuss audit form responses, and develop remedial action plans.
- A compliance report was developed to document the compliance status of each performance measure. This report was then shared with the hatchery manager and IHOT representative.
- This hatchery evaluation report was written to document compliance with IHOT performance measures and develop cost estimates for remedial actions when needed.

## Entiat NFH - Spring Chinook Results

The Entiat NFH facility includes two ponds for adult holding, 12 concrete raceways, 30 raceways, 43 starting tanks, and incubation facilities. Entiat NFH was originally authorized by the Grand Coulee Fish Maintenance in 1937 and re-authorized by the Mitchell Act in 1938. The original hatchery purpose was to mitigate for the loss of salmon spawning grounds caused by the Grand Coulee Dam.

The Entiat NFH - Spring Chinook program was in general compliance with most of the performance measures. In the area of program objectives, the hatchery was not meeting its adult return goal. The audit found that the hatchery was not in compliance with the water quality monitoring requirements, temperature criteria for rearing, pathology-free water criteria, alarm requirements, predation control facilities, and release facilities, which are all facilities requirements. The hatchery also exceeded its flow criteria for incubation loading and density criteria for rearing. The hatchery did not have smoltification goal or monitoring plan and was not meeting its size at release goal. The hatchery did not have a Genetics Monitoring and Evaluation Program.

The specific areas in which the Entiat NFH - Spring Chinook program requires remedial actions based on the IHOT performance measures are listed below. These remedial actions are listed in alphabetical order without intent of ranking or otherwise assigning priority:

- Change production to reduce density and segregate lots of fish to improve fry-to-smolt survival
- Change rearing procedures or IHOT size goal
- Change rearing procedures or increase rearing space to meet IHOT density criteria just before release
- Cover raceways and adult holding areas (31,000 sf) to reduce predation
- Develop a genetics M&E plan and have it reviewed by a qualified geneticist
- Develop smoltification goals and monitor
- Develop specific incubation and rearing standards for the IHOT Operations Plan
- Increase flow to incubators or change IHOT flow criteria
- Install alarm at intake
- Modify operations to meet IHOT loading criteria for rearing
- Monitor DO and TGP
- Provide disease-free water for incubation and early rearing
- Remove existing grating at end of pipe and install removable grating; isolate release piping from storm drain piping
- Review IHOT temperature criteria for rearing
- Run analysis for water chemistry parameters, turbidity, alkalinity, hardness, nitrite, and contaminants

Non-compliance issues resulting from items beyond human control or Performance Measures not relevant to this hatchery were not listed above.

## Facility Description

<b>Name:</b>	Entiat National Fish Hatchery
<b>Stock/Species:</b>	Spring Chinook
<b>Operating Agency:</b>	U.S. Fish and Wildlife Service
<b>Funding Agency:</b>	U.S. Bureau of Reclamation
<b>Location:</b>	Entiat NFH is located along the Entiat River, east of Entiat, Washington. The facility is operated as a satellite of Leavenworth NFH.
<b>Address:</b>	12790 Fish Hatchery Road Leavenworth, WA 98826
<b>Hatchery Manager:</b>	Mr. Bill Edwards
<b>Phone:</b>	(509) 784-1131
<b>Fax:</b>	(509) 784-2964
<b>Purpose:</b>	Entiat NFH was originally authorized by the Grand Coulee Fish Maintenance in 1937 and re-authorized by the Mitchell Act in 1938. It began operations in 1941. The original hatchery purpose was to mitigate for the loss of salmon spawning grounds caused by the Grand Coulee Dam. The goals of the hatchery are to produce spring chinook to help compensate for fish losses in the upper Columbia River drainage caused by construction of Grand Coulee Dam.
<b>Production Goal:</b>	<b>Spring Chinook</b>  Produce 400,000 yearling spring chinook smolts for on-station releases  Produce 400,000 subyearling spring chinook smolts for on-station releases

**Water Supply:**

Water rights total 15,340 gpm from three sources: the Entiat River, Packwood Springs and wells. Approximately 7,786 gpm is available for hatchery use. The Entiat River and wells provide most of this water flow.

**Facilities:**

Adult Holding:	2 concrete adult holding ponds - 9,600 cf each
Incubation:	18 double vertical stack incubators - 288 trays
Early Rearing:	27 circular fiberglass tanks - 40 cf each 16 rectangular fiberglass tanks - 89 cf each 4 troughs - 21 cf each
Raceways:	30 concrete raceways - 1,500 cf each
Rearing Ponds:	None
Satellite Facilities:	None

## Remedial Actions

Based on the compliance status for each performance measure, remedial actions were developed. The required remedial actions are organized into five categories. The types of categories range across a spectrum from those actions that are beyond human control, to those that require a change in agency policy or procedures, to those that involve a significant capital cost to put in place. The following are the five types of remedial actions identified under phase 1 of the audit:

**The Five Types of Remedial Actions**

Type	Description
1	Non-compliance issues resulting from items beyond human control or Performance Measures not relevant for this hatchery
2	Remedial actions requiring changes in agency policies or procedures
3	Remedial actions requiring changes in monitoring coverage or interval
4	Remedial actions requiring significant capital expenditures
5	Remedial actions that may require significant capital expenditures but are not clearly definable at this time

### Remedial Actions at Entiat NFH - Spring Chinook

This section presents the corrective actions required to bring the Entiat NFH - Spring Chinook program into compliance with IHOT performance measures. The remedial actions described here are suggestions developed by the Montgomery Watson Audit Team. The remedial actions and associated cost estimates have not been analyzed or prioritized by the respective operating agencies, fishery managers, or IHOT. There may be additional remedial actions, not included in this report, proposed by the respective operating agencies. For some non-compliance areas, other remedial actions could be proposed. The required remedial actions are cross-referenced to each IHOT performance measure that was not in compliance. Where appropriate, the costs associated with the remedial actions are also presented (Table 3).

The cost estimates presented in this section are based on professional experience from similar projects. In most cases, only a lump-sum figure is presented, and detailed take-off lists have not been prepared. The cost estimates are essentially order of magnitude estimates ( $\pm 40\%$ ).

The suggested remedial activities may also present several levels of action. Optional actions have been listed for several problems. These optional actions are desirable for either operational or safety considerations.



**Table 3. Remedial Actions Required at Entiat NFH - Spring Chinook**

Remedial Action Required	Cost	PMs <sup>1</sup>
<b>Type 1</b> - Non-compliance issues resulting from items beyond human control or Performance Measures not relevant for this hatchery		
Improve adult returns	----	4c, 4g, 4h, 22a4, 42c, 42e,
Fence hatchery and install security alarms	----	6
<b>Type 2</b> - Remedial actions requiring changes in agency policies or procedures		
Change production to reduce density and segregate lots of fish to improve fry-to-smolt survival	----	4f
Review IHOT temperature criteria for rearing	----	5a
Develop specific incubation and rearing standards for the IHOT Operations Plan	----	18-19
Increase flow to incubators or change IHOT flow criteria	----	18
Modify operations to meet IHOT loading criteria for rearing	----	19
Develop smoltification goals and monitor	----	22a1
Change rearing procedures or increase rearing space to meet IHOT density criteria just be release	----	22a2
Change rearing procedures or IHOT size goal	----	22a5
Develop a genetics M&E plan and have it reviewed by a qualified geneticist	----	43
<b>Type 3</b> - Remedial actions requiring changes in monitoring coverage or interval		
Monitor DO and TGP	----	5b
Run analysis for water chemistry parameters, turbidity, alkalinity, hardness, nitrite, and contaminants	----	5c-5g

<sup>1</sup> PMs are performance measures that were extracted from the IHOT 1995 report.

Remedial Action Required	Cost	PMs <sup>1</sup>
<b>Type 4</b> - Remedial actions requiring significant capital expenditures Install alarm at intake Cover raceways and adult holding areas (31,000) to reduce predation Remove existing grating at end of pipe and install removable grating; isolate release piping from storm drain piping	\$10,000 \$50,000 \$55,000	6 11 13
<b>Type 5</b> - Remedial actions that may require significant capital expenditures but are not clearly definable at this time Provide disease-free water for incubation and early rearing	----	5h

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<sup>1</sup> PMs are performance measures that were extracted from the IHOT 1995 report.

## Hatchery Contribution to Fisheries, Spawning Grounds, and Hatcheries

This section presents the audit findings for the Entiat NFH - Spring Chinook program contribution of adult fish to fisheries, local fisheries, spawning grounds, and hatcheries (Table 4). Data is reported by broodyear. A broodyear refers to the adult contribution from the eggs produced from a single group of spawning adults. For some species, this may include fish caught as 2-, 3-, 4-, 5-, and 6-year old fish. Because of the return distribution and data processing delays, the complete adult contribution for a given broodyear may not be available until 4 to 5 years after the fish have been released from the hatchery.

**Table 4. Adult Contribution to Fisheries, Spawning Grounds, and Hatcheries:  
Entiat NFH - Spring Chinook**

Year	Fisheries <sup>1</sup> (Broodyear)	Spawning Grounds <sup>1</sup> (Broodyear)	Hatchery <sup>1</sup> (Broodyear)	Total Combined Contribution <sup>2</sup> (Broodyear)	Smolt to Adult Survival (percent)
1981					
1982					
1983					
1984					
1985					
1986					
1987					
1988	63	0	536	599	0.10
1989	7	0	405	412	0.050
1990					
1991					
1992					

<sup>1</sup> Data obtained from Missing Production Groups Annual Report or from the Regional Mark Information System database.

<sup>2</sup> Total combined adult contribution; presented when it is not possible to subdivide the contribution into fisheries, spawning grounds, and hatchery contributions.

## Annual Operating Expenditures

The level and detail of annual operating expenditures varies widely depending on hatchery, operating agency, and funding source. When provided, expenditures were presented in terms of personnel costs, operating costs (power, feed, supplies), capital costs, indirect costs charged to the federal government, third-party costs, and other costs. These cost components were summed to determine a total hatchery annual cost. Based on discussion with the hatchery manager, the percent of total hatchery costs allocated to a given program was estimated. The total hatchery costs and the percent of hatchery costs allocated to a given program were used to compute the cost of a given program. The total expenditures for the Entiat NFH are presented in Table 5 by program. The detailed breakdown of program expenditures at this hatchery are presented in separate tables (Table 6).

**Table 5. Annual Operating Expenses - Entiat NFH**

<b>Program</b>	<b>1993</b>	<b>1994</b>	<b>1995</b>
1. Spring Chinook	<b>\$208,349</b>	<b>\$255,184</b>	<b>\$222,938</b>
2.			
3.			
4.			
5.			
<b>Total Hatchery Costs</b>	<b>\$208,349</b>	<b>\$255,184</b>	<b>\$222,938</b>

**Table 6. Detailed Expenditures at Entiat NFH by Program**

**Spring Chinook**

<b>Component</b>	<b>1993</b>	<b>1994</b>	<b>1995</b>
Personnel Costs	\$127,677	\$126,499	\$126,978
Operational Costs	\$76,575	\$92,585	\$63,654
Capital Costs	\$0	\$29,682	\$29,368
Indirect Costs	\$4,097	\$6,418	\$2,938
Lumped Hatchery Costs <sup>1</sup>			
Lumped Third-Party Costs			
<b>Total Hatchery Costs</b>	<b>\$208,349</b>	<b>\$255,184</b>	<b>\$222,938</b>
<b>Source of Funds</b>			
USBR	100%	100%	100%
Program Production (lb)			
Total Production (lb)			
Program as Percent of Total	100%	100%	100%
<b>Program Costs</b>	<b>\$208,349</b>	<b>\$255,184</b>	<b>\$222,938</b>

<sup>1</sup> When it was not possible to obtain a detailed cost breakdown from an agency or third party, the undivided costs were entered here.