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LEAVENWORTH HATCHERY

A COMPILATION AND SUMMARY OF  
IHOT AUDITS FOR SPRING CHINOOK  
AND SUMMER STEELHEAD

JULY 1998

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**HATCHERY EVALUATION REPORT  
SUMMARY FOR**

**Leavenworth NFH  
- Spring Chinook**

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

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## Executive Summary

This report compiles a summary of the findings of two separate Hatchery Evaluation Reports for Spring Chinook and Summer Steelhead at Leavenworth National Fish 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.

The hatchery is located along Icicle Creek, a tributary of the Wenatchee River approximately 30 miles above the Wenatchee's confluence with the Columbia River. The hatchery is about 4 miles northeast of Leavenworth, Washington. Entiat NFH and Withrop NFH are operated as satellite facilities. The hatchery is operated by the US Fish and Wildlife Service and is used for adult collection, incubation, and rearing of summer steelhead and 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.

## **Leavenworth NFH - Spring Chinook and Summer Steelhead Results**

The Leavenworth facility includes two ponds for adult holding, 45 concrete raceways, 37 Foster Lucas rearing ponds, 108 starter tanks, and incubation facilities. The hatchery was originally authorized by the Grand Coulee Fish Maintenance Project in 1937 and re-authorized by the Mitchell Act in 1938. It began operations in 1942. Leavenworth is one of three mid-Columbia hatcheries constructed by the Bureau of Reclamation as mitigation for the Grand Coulee Dam - Columbia Basin Project.

### **SPRING CHINOOK**

The Leavenworth 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 egg take and smolt-to-adult goals. The audit found that the hatchery was not in compliance with the rearing temperature criteria, water quality monitoring, alarm, predator control, and release facility requirements, which are all facilities requirements. The hatchery needed to develop specific incubation and rearing standards for the IHOT Operations Plan. In the compliance area for fish health policy, the hatchery did have foot baths in the incubation areas. The hatchery did not have a Genetics Monitoring and Evaluation Plan.

The specific areas in which the Leavenworth 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:

- Develop genetics M&E plan and have it reviewed by a qualified geneticist
- Develop groundwater supply and/or temperature control to meet IHOT temperature criteria
- Develop smoltification goal and monitor
- Develop specific incubation and rearing standards for the IHOT Operations Plan
- Follow IHOT requirements for daily checking of flow alarms
- Install foot baths in the incubation areas
- Install security alarms
- Monitor TGP and record
- Provide cover and fencing for adult holding and raceways (48,700 sf)
- Provide intake alarm
- Provide new release facilities and redesign discharge channel and fishway
- 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.

### **SUMMER STEELHEAD**

The Leavenworth NFH - Summer Steelhead program was in general compliance with most of the performance measures. This program is being discontinued at Leavenworth NFH and transferred to the Winthrop NFH after the 1997, so the completion of the remedial actions section was more difficult than for most hatcheries. In the area of program objectives, the hatchery was not meeting egg take and adult return goals. The audit found that the hatchery was not in compliance with the rearing temperature criteria, water quality monitoring, alarm, predator control, and release facility requirements, which are all facilities requirements. The hatchery needed to develop specific incubation and rearing standards for the IHOT Operations Plan. In the compliance area for fish health policy, the hatchery did have foot baths in the incubation areas. The hatchery did not have a

M&E program that allowed identification of Leavenworth NFH fish or Genetics Monitoring and Evaluation Plan.

The specific areas in which the Leavenworth NFH - Summer Steelhead 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:

- Develop genetics M&E plan and have it reviewed by a qualified geneticist
- Develop groundwater supply and/or temperature control to meet IHOT temperature criteria
- Develop M&E program for steelhead that distinguishes Leavenworth steelhead from state fish
- Develop smoltification goal and monitor
- Develop specific incubation and rearing standards for the IHOT Operations Plan
- Follow IHOT requirements for daily checking of flow alarms
- Install foot baths in the incubation areas
- Install security alarms
- Monitor TGP and record
- Provide cover and fencing for adult holding and raceways (48,700 sf)
- Provide intake alarm
- Provide new release facilities and redesign discharge channel and fishway
- 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>	Leavenworth National Fish Hatchery
<b>Stock/Species:</b>	Summer Steelhead Spring Chinook
<b>Operating Agency:</b>	U.S. Fish and Wildlife Service
<b>Funding Agency:</b>	U.S. Bureau of Reclamation
<b>Location:</b>	The hatchery is located along Icicle Creek, a tributary of the Wenatchee River approximately 30 miles above the Wenatchee's confluence with the Columbia River. The hatchery is about 4 miles northeast of Leavenworth, Washington. Entiat NFH and Winthrop NFH are operated as satellite facilities.
<b>Address:</b>	12790 Fish Hatchery Road Leavenworth, WA 98826
<b>Hatchery Manager:</b>	Mr. Dan Davies
<b>Phone:</b>	(509) 548-7641
<b>Fax:</b>	(509) 548-6263
<b>Purpose:</b>	<p>The hatchery was originally authorized by the Grand Coulee Fish Maintenance Project in 1937 and re-authorized by the Mitchell Act in 1938. It began operations in 1942. Leavenworth is one of three mid-Columbia hatcheries constructed by the Bureau of Reclamation as mitigation for the Grand Coulee Dam - Columbia Basin Project.</p> <p>The goal of the hatchery is to produce spring chinook and summer steelhead to help compensate for fish losses in the Columbia River Basin caused by the Grand Coulee Dam.</p>
<b>Production Goal:</b>	<p><b>Summer Steelhead</b></p> <p>Produce 100,000 smolts for on-station release</p> <p><b>Spring Chinook</b></p> <p>Produce 1.6 million smolts for on-station release</p>



**Water Supply:**

Water rights total 25,551 gpm from wells, Icicle Creek, and Snow and Nada lakes. Average flow available to the hatchery is 18,170 gpm. There is insufficient water to operate all rearing facilities. Water from Snow and Nada lakes is used to supplement Icicle Creek during low flow periods.

**Facilities:**

Adult Holding:	2 concrete brood ponds - 7,800 cf each
Incubation:	600 individual bucket incubators 72 deep troughs with trays
Early Rearing:	108 fiberglass starter tanks - 90 cf each
Raceways:	45 raceways - 1,600 cf each 30 Foster Lucas raceways - 3,876 cf each 7 Foster Lucas raceways - 13,572 cf each
Rearing Ponds:	None
Satellite Facilities:	Entiat and Winthrop NFH

Section 3  
**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 Leavenworth NFH - Spring Chinook and Summer Steelhead**

This section presents the corrective actions required to bring the Leavenworth NFH - Spring Chinook and Summer Steelhead programs 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 (Tables 3a and 3b).

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 3a. Remedial Actions Required at Leavenworth NFH - Spring Chinook**

Remedial Action Required	Cost	PMS <sup>1</sup>
<p><b>Type 1</b> - Non-compliance issues resulting from items beyond human control or Performance Measures not relevant for this hatchery</p> <p>Improve adult returns</p>	----	4c, 4h
<p><b>Type 2</b> - Remedial actions requiring changes in agency policies or procedures</p> <p>Follow IHOT requirements for daily checking of flow alarms</p> <p>Develop specific incubation and rearing standards for the IHOT Operations Plan</p> <p>Develop smoltification goal and monitor</p> <p>Install foot baths in the incubation areas</p> <p>Develop genetics M&amp;E plan and have it reviewed by a qualified geneticist</p>	<p>----</p> <p>----</p> <p>----</p> <p>----</p> <p>----</p>	<p>6</p> <p>18</p> <p>22a1</p> <p>28</p> <p>43</p>
<p><b>Type 3</b> - Remedial actions requiring changes in monitoring coverage or interval</p> <p>Monitor TGP and record</p> <p>Run analysis for water chemistry parameters, turbidity, alkalinity, hardness, nitrite, and contaminants</p>	<p>----</p> <p>----</p>	<p>5b</p> <p>5c-5g</p>
<p><b>Type 4</b> - Remedial actions requiring significant capital expenditures</p> <p>Provide intake alarm</p> <p>Install security alarms</p> <p>Provide cover and fencing for adult holding and raceways (48,700 sf)</p> <p>Provide new release facilities and redesign discharge channel and fishway</p>	<p>\$10,000</p> <p>\$10,000</p> <p>\$100,000</p> <p>\$250,000 to \$500,000</p>	<p>6</p> <p>6</p> <p>11</p> <p>13</p>
<p><b>Type 5</b> - Remedial actions that may require significant capital expenditures but are not clearly definable at this time</p> <p>Develop groundwater supply and/or temperature control to meet IHOT temperature criteria</p>	----	5a

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

**Table 3b. Remedial Actions Required at Leavenworth NFH - Summer Steelhead**

Remedial Action Required	Cost	PMS <sup>1</sup>
<p><b>Type 1</b> - Non-compliance issues resulting from items beyond human control or Performance Measures not relevant for this hatchery</p> <p>Improve adult returns</p>	----	4c, 4h, 22a4, 41c, 42c, 42e, 42f
<p><b>Type 2</b> - Remedial actions requiring changes in agency policies or procedures</p> <p>Develop M&amp;E program for steelhead that distinguishes Leavenworth steelhead from state fish</p> <p>Follow IHOT requirements for daily checking of flow alarms</p> <p>Develop specific incubation and rearing standards for the IHOT Operations Plan</p> <p>Develop smoltification goal and monitor</p> <p>Install foot baths in the incubation areas</p> <p>Develop genetics M&amp;E plan and have it reviewed by a qualified geneticist</p>	<p>----</p> <p>----</p> <p>----</p> <p>----</p> <p>----</p> <p>----</p>	<p>4a, 24</p> <p>6</p> <p>18</p> <p>22a1</p> <p>28</p> <p>43</p>
<p><b>Type 3</b> - Remedial actions requiring changes in monitoring coverage or interval</p> <p>Monitor TGP and record</p> <p>Run analysis for water chemistry parameters, turbidity, alkalinity, hardness, nitrite, and contaminants</p>	<p>----</p> <p>----</p>	<p>5b</p> <p>5c-5g</p>

<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 Provide intake alarm Install security alarms Provide cover and fencing for adult holding and raceways (48,700 sf) Provide new release facilities and redesign discharge channel and fishway	\$10,000 \$10,000 \$100,000 \$250,000 to \$500,000	6 6 11 13
<b>Type 5</b> - Remedial actions that may require significant capital expenditures but are not clearly definable at this time Develop groundwater supply and/or temperature control to meet IHOT temperature criteria	----	5a

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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 Leavenworth NFH - Spring Chinook and Summer Steelhead programs contribution of adult fish to fisheries, local fisheries, spawning grounds, and hatcheries (Tables 4a and 4b). 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 4a. Adult Contribution to Fisheries, Spawning Grounds, and Hatcheries:  
Leavenworth 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	3,011	14	3,248	6,273	0.27
1988	5,819	100	5,041	10,960	0.41
1989	2,360	0	2,449	4,809	0.19
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.

**Table 4b. Adult Contribution to Fisheries, Spawning Grounds, and Hatcheries:  
Leavenworth NFH - Summer Steelhead**

<b>Year</b>	<b>Fisheries<sup>1</sup> (Broodyear)</b>	<b>Spawning Grounds<sup>1</sup> (Broodyear)</b>	<b>Hatchery<sup>1</sup> (Broodyear)</b>	<b>Total Combined Contribution<sup>2</sup> (Broodyear)</b>	<b>Smolt to Adult Survival (percent)</b>
1981					
1982					
1983					
1984					
1985					
1986					
1987	No data available	No data available	No data available	No data available	No data available
1988	No data available	No data available	No data available	No data available	No data available
1989	No data available	No data available	No data available	No data available	No data available
1990	No data available	No data available	No data available	No data available	No data available
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, and 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 Leavenworth NFH are presented in Table 5 by program. The detailed breakdown of program expenditures for spring chinook and summer steelhead at this hatchery are presented in separate tables (Tables 6a and 6b).

**Table 6. Annual Operating Expenses - Leavenworth NFH**

<b>Program</b>	<b>1993</b>	<b>1994</b>	<b>1995</b>
1. Spring Chinook	<b>\$629,647</b>	<b>\$749,884</b>	<b>\$1,847,302</b>
2. Summer Steelhead	<b>\$69,960</b>	<b>\$102,257</b>	<b>\$97,226</b>
3.			
4.			
5.			
<b>Total Hatchery Costs</b>	<b>\$699,608</b>	<b>\$852,142</b>	<b>\$1,944,528</b>



**Table 6a. Detailed Expenditures at Leavenworth NFH by Program**  
**Spring Chinook**

<b>Component</b>	<b>1993</b>	<b>1994</b>	<b>1995</b>
Personnel Costs	\$439,140	\$442,626	\$504,302
Operational Costs	\$254,012	\$347,685	\$347,997
Capital Costs	\$6,456	\$61,831	\$768,182 <sup>1</sup>
Indirect Costs			
Lumped Hatchery Costs <sup>2</sup>			
Lumped Third-Party Costs			
<b>Total Hatchery Costs</b>	<b>\$699,608</b>	<b>\$852,142</b>	<b>\$1,944,528</b>
<b>Source of Funds</b>			
USBR	<b>100%</b>	<b>100%</b>	<b>100%</b>
Program Production (lb)	79,700	105,552	112,363
Total Production (lb)	88,789	120,140	117,732
Program as Percent of Total	90%	88%	95%
<b>Program Costs</b>	<b>\$629,647</b>	<b>\$749,884</b>	<b>\$1,847,302</b>

<sup>1</sup> \$748,000 for construction of sand settling basin in 1995.

<sup>2</sup> When it was not possible to obtain a detailed cost breakdown from an agency or third party, the undivided costs were entered here.

**Table 6b. Detailed Expenditures at Leavenworth NFH by Program**

**Summer Steelhead**

<b>Component</b>	<b>1993</b>	<b>1994</b>	<b>1995</b>
Personnel Costs	\$439,140	\$442,626	\$504,302
Operational Costs	\$254,012	\$347,685	\$347,997
Capital Costs	\$6,456	\$61,831	\$768,182 <sup>1</sup>
Indirect Costs			
Lumped Hatchery Costs <sup>2</sup>			
Lumped Third-Party Costs			
<b>Total Hatchery Costs</b>	<b>\$699,608</b>	<b>\$852,142</b>	<b>\$1,944,528</b>
<b>Source of Funds</b>			
USBR	<b>100%</b>	<b>100%</b>	<b>100%</b>
Program Production (lb)	8,712	14,588	5,369
Total Production (lb)	88,789	120,140	117,732
Program as Percent of Total	10	12%	5%
<b>Program Costs</b>	<b>\$69,960</b>	<b>\$102,257</b>	<b>\$97,226</b>

<sup>1</sup> \$748,000 for construction of sand settling basin in 1995.

<sup>2</sup> When it was not possible to obtain a detailed cost breakdown from an agency or third party, the undivided costs were entered here.