
HATCHERY EVALUATION REPORT

Chelan Hatchery - Summer Steelhead

December 1996

Integrated Hatchery Operations Team (IHOT)

HATCHERY EVALUATION REPORT

Chelan Hatchery - Summer Steelhead

An Independent Audit Based on Integrated Hatchery Operations Team (IHOT) Performance Measures

Prepared by:

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

Prepared for:

U.S. Department of Energy
Bonneville Power Administration
Environment, Fish and Wildlife
P.O. Box 3621
Portland, OR 97208-3621

Project Number 95-2
Contract Number 95AC49468

December 1996

CONTENTS

Section 1 Executive Summary	1-1
Section 2 Facility Description	2-1
Section 3 Compliance Status.....	3-1
Section 4 Remedial Actions	4-1
Section 5 Hatchery Contribution to Fisheries, Spawning Grounds and Hatcheries	5-1
Section 6 Annual Operating Expenditures	6-1

List of Tables

Table

1	Summary Program Information for Chelan Hatchery - Summer Steelhead
2	Compliance with Performance Measures: Chelan Hatchery - Summer Steelhead
3	Remedial Actions Required at Chelan Hatchery - Summer Steelhead
4	Adult Contribution to Fisheries, Spawning Grounds and Hatcheries: Chelan Hatchery - Summer Steelhead
5	Annual Operating Expenses: Chelan Hatchery - Summer Steelhead
6	Annual Operating Expenses - Chelan Hatchery

Executive Summary

This report presents the findings of the independent audit of the Chelan Hatchery - Summer Steelhead program. Chelan Hatchery is located on the Columbia River above Rocky Reach Dam near Chelan Falls, Washington. The hatchery is used for incubation and early rearing of summer steelhead.

The audit was 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.

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). 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)*. That document 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.

Chelan Hatchery - Summer Steelhead Results

The Chelan facility includes 1 pond for adult holding, 16 concrete raceways, 2 portable vinyl lined raceways, 8 intermediate raceways, 4 spawning channels, and incubation facilities. Chelan Hatchery began operation in 1965 as a mitigation for Rocky Reach Dam.

The Chelan Hatchery - Summer Steelhead program was in compliance with few of the performance measures. This was primarily a result of failing to fill out the audit form and/or provide the required information to the audit team.

The specific areas in which the Chelan Hatchery - 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:

- Conduct fishery contribution studies
- Construct 4 more 10' x 100' concrete raceways
- Develop alarm log
- Develop approved genetics monitoring and evaluation program
- Develop monitoring and evaluation plan
- Develop specific incubation and rearing standards for IHOT Operations Plan
- Document adult contribution, eyed-egg to fry survival, fry-to-smolt survival, smolt production, and smolt-to-adult survival
- Document compliance with density and loading criteria for rearing
- Document compliance with IHOT DO and TGP criteria
- Document compliance with IHOT incubation and rearing temperature criteria
- Follow IHOT QA/QC tests for feed preparation
- Follow IHOT requirements for checking water flow alarms daily
- Follow IHOT requirements for disinfection of equipment used to collect dead fish prior to its use in another pond
- Follow IHOT requirements for disinfection of the exterior and interior of the transport vehicles
- Follow IHOT temperature criteria for hauling
- Install foot baths in incubation facilities
- Install security alarms
- Install telephone pages
- Review IHOT Operations Plan and discuss with staff
- 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 (Type 1 in Table 3, Section 4 of this report) were not listed above.

Facility Description

Name:	Chelan Hatchery
Stock/Species:	Summer Steelhead Rainbow Trout Kokanee
Operating Agency:	Washington Department of Fish and Wildlife
Funding Agency:	Chelan PUD
Location:	Chelan Hatchery is located on the Columbia River above Rocky Reach Dam near Chelan Falls, Washington.
Address:	Chelan Fish Hatchery Washington Department of Fish and Wildlife HCR 80, Box 52 Chelan, WA 98816
Hatchery Manager:	Mr. Steve Robards
Phone:	(509) 884-8301
Fax:	(509) 886-0823
Purpose:	Chelan Hatchery began operation in 1965 as a mitigation for Rocky Reach Dam. Chelan PUD owns the hatchery and funds its operation and maintenance.
Production Goal:	Summer Steelhead Produce 200,000 smolts for off-station release from Turtle Rock Hatchery
Water Supply:	Water rights total 14,812 gpm from three sources: a well field, the Columbia River, and springs. Columbia River water is no longer used due to concerns over IHN. Spring water averages about 500 gpm. Average total water use is about 3,000 gpm, of which 2,500 gpm is well water.
Facilities:	
Adult Holding:	1 concrete adult holding raceway - 3,600 cf
Incubation:	80 shallow troughs - 7 cf each
Early Rearing:	80 shallow troughs - 7 cf each 8 intermediate raceways - 214 cf each

Raceways: 16 standard raceways - 2,308 cf each
2 vinyl portable raceways - 1,651 cf each
Rearing Ponds: 4 spawning channels - 29,000 cf each
Satellite Facilities: None

Compliance Status

The hatchery audits are based on compliance with written IHOT performance measures. These performance measures are documented in *Policies and Procedures for Columbia Basin Anadromous Salmonid Hatcheries* (referred to as *IHOT 1995* in this report).¹ The purpose of the performance measures is to implement new basinwide policies that provide regional guidelines for operating anadromous hatcheries in the Columbia Basin.

The audit focuses on performance measures for IHOT policies that cover (1) hatchery performance standards, (2) fish health, (3) ecological interaction, and (4) genetics. These performance measures are intended to guide hatchery operations once production is established. For that reason, the hatchery operations audit included broodstock collection, spawning, incubation of eggs, fish rearing and feeding, fish release, equipment maintenance and operations, and personnel training. Production priorities are beyond the scope of this audit.

Based on *IHOT 1995*, a detailed 109-page audit form was developed. The audit form divided the performance measures into six major sections along major program and technical criteria areas. Two additional sections (sections 1 and 8) include general information and expenditure information needed for this Hatchery Evaluation Report and blank forms for additional comments. The following is the basic structure of the IHOT audit form:

Section 1	Performance Measures for General Information and Expenditure Information (PMs General 1-2)
Section 2	Performance Measures for Program Objectives (PMs 1-4)
Section 3	Performance Measures for Facility Requirements (PMs 5-15)
Section 4	Performance Measures for Hatchery Practices (PMs 16-25)
Section 5	Performance Measures for Fish Health Policy (PMs 26-34)
Section 6	Performance Measures for Ecological Interactions (PMs 35-38)
Section 7	Performance Measures for Genetics Policy (PMs 39-43)
Section 8	Blank Forms for Additional Comments

Several performance measures are repeated in various sections of the audit form. These performance measures overlap in *IHOT 1995* and were retained to allow individuals interested in specific portions of the audit (such as Genetics or Fish Health) to determine the compliance status of all performance measures for a given topic in one location. A repeated performance measure is indicated by shaded text.

The Hatchery Audit Process

The hatchery audit will be conducted over a 2-year period that concludes in 1997. At each hatchery, a five-step process was used to complete the overall hatchery audit. This process consisted of research and onsite visits. The site visit at the Chelan Hatchery was conducted on October 28, 1996.

¹Integrated Hatchery Operations Team (IHOT) 1995. *Policies and Procedures for Columbia Basin Anadromous Salmonid Hatcheries*, Bonneville Power Administration, Portland, Oregon.

The following is the five-step audit process:

1. Information was obtained from headquarters.
2. The hatchery manager was asked to fill out and return the **Audit Form**.
3. A 1-2 day site audit visit was conducted at each hatchery. During that visit an audit team inspected facilities, reviewed hatchery records, discussed audit form responses, and developed remedial action plans when appropriate.
4. During the site visit, the compliance status of each performance measure was discussed with the hatchery manager and IHOT representative. A portion of the Hatchery Evaluation Report was sent to the hatchery manager following the audit visit as a **Compliance Report**. That Compliance Report is Table 2 of this report.
5. Information from steps 1-4 was used to prepare a draft **Hatchery Evaluation Report**. This draft report was submitted to the operating agencies for review of the information used to determine compliance. Based on review and comments, a final Hatchery Evaluation Report was developed. The final report documents the compliance of a particular hatchery with the IHOT performance measures and presents cost estimates to correct any deficiencies.

Compliance Status of Chelan Hatchery - Summer Steelhead

The following table includes information on life-stages that are held on this facility for some portion of their rearing cycle (Table 1). For multi-facility programs, summary cost and contribution data is presented at the facility where rearing occurs. For the compliance status relating to performance measures that do not occur at this hatchery, please refer to the Hatchery Evaluation Reports for the hatcheries and stocks listed in Table 1. A check mark (✓) indicates that the specific life-stage is held at this facility.

This section documents the compliance status of the Chelan Hatchery - Summer Steelhead program. Each performance measure is presented in a table taken from the audit form (Table 2). The compliance status is identified by the following categories:

- **N/A** (not applicable)
- **Yes** (in compliance)
- **?** (unknown; generally due to unavailability of information to determine compliance)
- **No** (not in compliance).

Remedial actions are suggested for performance measures not in compliance. These remedial actions are grouped into categories and listed in Section 4 of this report, where the cost of the required remedial actions is also presented.

Table 1 Summary Program Information for Chelan Hatchery - Summer Steelhead

Component	Location of Adult Holding, Spawning, Incubation, and Rearing					
	Wells Hatchery	Chelan Hatchery	Turtle Rock Hatchery			
Adult Collection	✓					
Adult Holding	✓					
Spawning	✓					
Fertilization	✓					
Incubation	✓					
green-to-eyed	✓					
eyed-to-hatch		✓				
Rearing						
fry		✓				
fingerlings		✓				
smolts			✓			
Acclimation/release			✓			

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
the hatchery programs outlined in a subbasin management plan?		✓			Columbia Basin System Planning Production Plan and FERC license for Rocky Reach Dam	
Is the hatchery operating under a current hatchery operational plan?		✓			IHOT Operations Plan	
Is it understood by staff?				✓		Discuss Operations Plan with staff
Is it being followed?				✓		Discuss Operations Plan with staff
Is a hatchery monitoring and evaluation plan in place?						
Do you have a written monitoring and evaluation plan?				✓	No information provided	Develop monitoring and evaluation plan
What is the adult contribution to fisheries, spawning grounds, and hatchery				✓	No information provided	Document adult contribution
What is the adult pre-spawning survival as compared with established goal	✓				Adult spawning at Wells Hatchery	
What is the egg take as compared with established hatchery goal	✓				Egg take at Wells Hatchery	
What is the hatchery egg to eyed-egg survival as compared with established goal	✓				Incubation at Wells Hatchery	
What is the eyed-egg to fry survival as compared with established goal			✓		Review of records; in compliance 1 out of last 1 years	Document eyed-egg to fry survival
What is the fry to smolt survival as compared with established goal			✓		No information provided	Document fry-to-smolt survival
What is the smolt production as compared with established goal			✓		No information provided	Document smolt production
What is the smolt to adult survival (smolt to adult) as compared with established goal			✓		Review of records; in compliance No information provided	Document smolt-to-adult survival
What is the number of eggs, fry, fingerlings, smolts, and/or adults meet basinwide needs	✓				Review of records/Discussion	

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
Temperature						
Does your water temperature meet the criteria for spawning?	✓				Spawning at Wells Hatchery	
Does your water temperature meet the criteria for incubation?			✓		No information provided	Document compliance with IHOT incubation temperature criteria
Does your water temperature meet the criteria for rearing?			✓		No information provided	Document compliance with IHOT rearing temperature criteria
Dissolved gases						
Is the oxygen level near saturation?			✓		Review of records/Discussion	Document compliance with IHOT oxygen criteria
Is the dissolved nitrogen level less than saturation?			✓		Review of records/Discussion	Document compliance with IHOT nitrogen criteria
Chemistry						
Ammonia (un-ionized)			✓		No information provided	Run analysis for water chemistry parameters
Carbon Dioxide			✓		See above	See above
Chlorine			✓		See above	See above
H			✓		See above	See above
Copper			✓		See above	See above
Hydrogen Sulfide			✓		See above	See above
Iron			✓		See above	See above
Zinc			✓		See above	See above
Turbidity						
Does your turbidity meet the criteria?			✓		No information provided	Run analysis

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
Alkalinity and hardness						
Does your alkalinity and hardness meet the criteria?			✓		No information provided	Run analysis for alkalinity and hardness
Nitrite						
Does your nitrite meet the criteria?			✓		No information provided	Run analysis for nitrite
Contaminants						
Aldrin			✓		No information provided	Run analysis for contaminants
Dieldrin			✓		See above	See above
Diieldrin			✓		See above	See above
Heptachlor			✓		See above	See above
Chlordane			✓		See above	See above
Methoxychlor			✓		See above	See above
Endane			✓		See above	See above
Malathion			✓		See above	See above
Parathion			✓		See above	See above
Diseases						
What portions of the hatchery have disease-free water?						
Adult holding	✓				Adult holding at Wells Hatchery Inspection of facilities/Discussion Inspection of facilities/Discussion Inspection of facilities/Discussion	
Incubation		✓				
Early rearing		✓				
Rearing		✓				
Others	✓					

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
Alarm Systems						
Do the following areas have alarms?						
Intake		✓			Inspection of facilities/Discussion	
Large rearing ponds and adult holding ponds	✓				No adult holding on station	
Raceway headboxes and rearing ponds		✓			Inspection of facilities/Discussion	
Incubation facilities		✓			Inspection of facilities/Discussion	
Quarantine areas and facilities	✓				None	
Water treatment systems	✓	✓			None	
Security				✓	Inspection of facilities/Discussion	Install security alarms
Are there outside systems and buzzers in onsite residences?		✓			Discussion	
Are water flow alarms checked daily?				✓	Review of records/Discussion	Follow IHOT requirements for checking water flow alarms daily
Are all other alarms checked weekly?		✓			Discussion	
Is there a log of alarms for emergencies, tests, and maintenance requirements?				✓	Review of records/Discussion	Develop alarm log
Are telephone pagers used?				✓	Discussion	Install telephone pagers
Adult collection and holding facilities						
Do you meet the adult holding criteria?	✓				Adult holding at Wells Hatchery	

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
Spawning facilities Type 1: Egg Baskets Do you have an adequate number of units for the overall program? Type 2: _____ Do you have an adequate number of units for the overall program?		✓			Inspection of facilities/Discussion	
Rearing facilities Type 1: Shallow Troughs Do you have an adequate number of units for the overall program? Type 2: Intermediate raceways Do you have an adequate number of units for the overall program? Type 3: Raceways Do you have an adequate number of units for the overall program?		✓			Inspection of facilities/Discussion Inspection of facilities/Discussion Fin nipping is a problem	Construct 4 more 10' x 100' concrete raceways
Feeding facilities Do you meet the approach velocity criteria? Are the fish screens regularly cleaned? Does the screen mesh meet screen opening criteria? Are rearing containers double screened for fish that should not be released to adjacent water?	✓ ✓ ✓ ✓				Spring supply See above See above Discussion	
Predator control facilities Are your predation control facilities effective?		✓			Inspection of facilities/Discussion	

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
d storage facilities and quality control						
Does the storage of dry/semi-moist/moist foods (dry <12%; semi-moist 12-20%; moist >20% moisture) follow food manufacturer's recommendations?		✓			Inspection of facilities/Discussion	
Does a regional quality control officer oversee production procedures and monitor:						
Verification by feed manufacturer that ingredients meet specifications?				✓	Discussion	Follow IHOT QA/QC for feed preparation
Ensure feed does not contain unwanted drugs or other additives?				✓	Discussion	Follow IHOT QA/QC for feed preparation
Analyze ingredients contained in the final food product to ensure that feed specifications have been met?				✓	Discussion	Follow IHOT QA/QC for feed preparation
Are the foods stored and handled according to the following criteria?						
Moist pellets should not exceed 10 °F at point of delivery.		✓			Discussion	
Moist pellets should be removed from freezer just prior to feeding.		✓			Discussion	
Do not leave buckets of feed or feed containers outside exposed to light or heat.		✓			Discussion	
Open bags of feed should be fed within 1 to 2 days except when feeding small groups of fish.		✓			Discussion	
Automatic feeder hoppers and bulk storage facilities should be insulated against excessive temperatures (80 °F and above).	✓				No bulk feeders	

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
Release facilities						
Do the release facilities ensure that fish are not subjected to adverse conditions?	✓				Transferred to Turtle Rock Hatchery for final rearing and release	
Pollution abatement facilities						
Do the pollution abatement facilities meet all federal and state regulations (or good engineering practice)?		✓			Inspection of facilities/Discussion	
Are pollution abatement facilities operated correctly?		✓			Discussion	
Transportation facilities						
Are the transport systems adequate to meet IHOT performance measures for transportation practices?		✓			Inspection of facilities/Discussion	

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
Broodstock selection practices						
Is the donor selection process document attached? (PM #40a)	✓				Existing program; does not apply	
Was the donor selection outline followed in selecting the hatchery broodstock? (PM #40b-c)	✓				Existing program; does not apply	
Spawning practices						
Were the appropriate number of spawners, male/female ratios, and fertilization protocols used? (PM #42c-g)	✓				Spawning at Wells Hatchery	
Incubation practices						
Are specific incubation standards listed in the hatchery operations plan?				✓	Reviewed IHOT Operations Plan	Develop specific incubation standards for the IHOT Operations Plan
Are incubation practices written?				✓	None supplied to inspection team	
Incubation Type 1: <u>Egg Baskets</u> (see PM #8) you meet the loading and flow criteria?		✓			Review of records/Discussion	
Incubation Type 2: _____ (see PM #8) you meet the loading and flow criteria?	✓					

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
rearing practices						
specific rearing standards listed in the hatchery operations plan?				✓	Review IHOT Hatchery Operations Plan	Develop specific incubation standards for the IHOT Operations Plan
rearing practices written?				✓		See above
rearing Unit Type 1: <u>Troughs</u> (see PM #9)						
Do you meet the density and DI criteria?			✓		Appears OK based on audit analysis, but no information supplied	Document density and DI values Document loading and FI values
Do you meet the Loading and FI criteria?			✓			
rearing Unit Type 2: <u>Intermediate raceways</u> (see PM #9)						
Do you meet the density and DI criteria?			✓		Appears OK based on audit analysis, but no information supplied	Document density and DI values Document loading and FI values
Do you meet the Loading and FI criteria?			✓			
rearing Unit Type 3: <u>Raceways</u> (see PM #9)						
Do you meet the density and DI criteria?			✓		Appears OK based on audit analysis, but no information supplied	Document density and DI values Document loading and FI values
Do you meet the Loading and FI criteria?			✓			
smolt quality						
Do you produce a high quality smolt?	✓				Transferred to Turtle Rock for final rearing and release	

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
Health management practices						
Are the monthly hatchery monitoring visits being conducted? (PM #26)		✓			Review of records/Discussion	
Are the annual broodstock inspections being conducted? (PM #27)		✓			Review of records/Discussion	
Is there pathogen-free water (PM #5h) and are the sanitation procedures being followed? (PM #28)				✓	Review of records/Discussion	See PM #28
Are the following water quality parameters within criteria? (PM #5a-5g)						
Water temperature			✓		Review of records/Discussion	See PM #5a
Dissolved gases			✓		Review of records/Discussion	See PM #5b
Chemistry			✓		Review of records/Discussion	See PM #5c
Turbidity			✓		Review of records/Discussion	See PM #5d
Alkalinity and hardness			✓		Review of records/Discussion	See PM #5e
Nitrite			✓		Review of records/Discussion	See PM #5f
Contaminants			✓		Review of records/Discussion	See PM #5g
Are rearing standards being followed? (PM #19)			✓		Review of records/Discussion	See PM #19
Are egg and fish transfer/release requirements met? (PM #31)		✓			Review of records/Discussion	

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
Do hatchery performance meet requirements defined in the regional hatchery policies and in basin and hatchery plans for the following areas?						
Percent smoltification						
Do you measure percent smoltification?	✓				Final rearing at Turtle Rock Hatchery	
Did you meet the smoltification criteria?	✓				See above	
Rearing density (prior to release)						
Did you meet the rearing density criteria just prior to release?	✓				Transferred to Turtle Rock for final rearing and release	
Disease condition (at release)						
Did you meet all disease regulations just prior to release?	✓				Transferred to Turtle Rock for final rearing and release	
Release number (at release)						
Did you meet the release number goal?	✓				Transferred to Turtle Rock for final rearing and release	
Release size (at release)						
Did you meet the size goal?	✓				Transferred to Turtle Rock for final rearing and release	
Release dates of release						
Did you meet the release date goal?	✓				Transferred to Turtle Rock for final rearing and release	
Release location of release						
Did you release the fish at the specified location?	✓				Transferred to Turtle Rock for final rearing and release	
Are fish reared in the subbasin or acclimated in the basin?						
Were the fish reared in the subbasin?	✓				Transferred to Turtle Rock for final rearing and release	
Were the fish acclimated in the subbasin?	✓				See above	
Is the release strategy appropriate for the program?	✓				Transferred to Turtle Rock for final rearing and release	

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
Transportation facilities						
Do transportation equipment and personnel receive disinfection before and after use?		✓			Discussion	
Is the fish tank interior disinfected using a solution of 200 ppm active chlorine for 30 minutes minimum or formaldehyde gas generation method (relative humidity of 60% for 2 hrs)?		✓			Discussion	
Is the exterior of the fish transport vehicle disinfected using high pressure steam (115-130°C), high temperature acid, or with 200 ppm chlorine for 30 minutes?				✓	Discussion	Follow IHOT requirements for disinfection of the exterior and interior of the transport vehicle
Is the fish transport vehicle (cab) disinfected using 600 ppm quaternary ammonia compounds (1.5 ml of 50% stock solution/liter water)?				✓	Discussion	See above
Is other equipment disinfected including fish pumps, nets, egg sorters, waders, boots, rain gear, hoses and other equipment using one of the following solutions? 200 ppm chlorine for 30 minutes 600 ppm quaternary ammonia compound for 30 minutes 200 ppm iodophor solution for 10 minutes		✓			Discussion	
Do personnel wear protective garments when handling fish eggs or cultural water?		✓			Discussion	
Do the fish transport truck/chassis and tank/unit receive an inspection and service prior to the release season?		✓			Discussion	
Is a daily service inspection completed before starting up and leaving for the day?		✓			Discussion	

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
Transportation facilities						
Does the fish transport unit receive an inspection prior to loading?		✓			Discussion	
Does a pre-loading inspection covering tank water level, pumps or aerators, oxygen injection system settings, displacement gauge, and truck loading/hauling density tables checked and reviewed occur prior to loading fish in the transport unit?		✓			Discussion	
Do hauling criteria include checking the fish 45 minutes to 1 hour after loading?		✓			Discussion	
When fish are active and systems are functioning properly, is the oxygen concentration reduced and maintained at approximately 8 ppm?		✓			Discussion	
Is water temperature in the transportation unit maintained within the 42-48 °F range?				✓	Discussion	Follow IHOT temperature criteria for hauling
Do fish releasing procedures include the following criteria?						
Releasing the fish at the correct release site or into the correct water body.		✓			Discussion	
Tempering or the difference between the liberation tank and the target water body should not exceed 10°F.		✓			Discussion	
The liberation hose should be angled so that fish gently hit the water. Using a tripod is a method of ensuring the hose will stay at the proper angle.		✓			Discussion	

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
Evaluation practices						
Has the hatchery conducted fishery contribution studies?						
Determine the requirements for evaluating and improving management programs?				✓	No information provided to team	Conduct fishery contribution studies
Develop guidelines that define the geographical area and identify component stocks (hatchery and/or wild) that comprise the management unit?				✓	See above	See above
Develop guidelines that define if the proper stocks of fish are currently being used?				✓	See above	See above
Determine which management units contribute to a specific fishery and the time periods of those contributions?				✓	See above	See above
Determine the relative contributions of the various management units to a specific fishery over the different time periods?				✓	See above	See above

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
ining practices						
Does the hatchery have a training schedule for its staff?		✓			Review of records/Discussion	
Does each staff member have a personal training plan approved by a supervisor and reviewed annually?		✓			Review of records/Discussion	
Does the hatchery routinely exchange training details between other hatcheries and agencies?		✓			Review of records/Discussion	
Does the hatchery encourage and reward off-duty training of staff?		✓			Review of records/Discussion	
Does the hatchery conduct monthly staff meetings?		✓			Review of records/Discussion	

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
<p>monthly hatchery monitoring visits being conducted by a qualified fish health specialist as described below?</p> <p>Conduct visit at least monthly</p> <p>Monitoring conducted by qualified fish health specialist</p> <p>Examine a representative sample of healthy and moribund fish from each lot.</p> <p>Review fish culture practices with hatchery manager.</p> <p>Report finding and results of necropsies on standard form.</p> <p>Recommend appropriate drug or chemical treatment.</p> <p>Summarize fish health status or stock prior to release or transfer to another facility.</p>		<p>✓</p> <p>✓</p> <p>✓</p> <p>✓</p> <p>✓</p> <p>✓</p>			<p>Review of records/Discussion</p>	
<p>all of the functions of the hatchery yearly monitoring visits being completed as described below?</p> <p>Annually examine each broodstock for the presence of reportable viral pathogens.</p> <p>Annually screen each salmon broodstock for the presence of <i>Renibacterium salmoninarum</i>.</p> <p>Conduct inspection by or under the supervision of qualified fish health specialist.</p>	<p>✓</p> <p>✓</p> <p>✓</p>			<p>Done at Wells Hatchery</p> <p>See above</p> <p>See above</p>		

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
Are hatchery sanitation procedures followed as described below?						
Are there any sources of pathogen-free water, especially for incubation and early rearing?		✓			Discussion	
Are the hatchery sanitation procedures understood and being followed as described below?						
Disinfect/water harden eggs in iodophor?	✓				Spawning at Wells Hatchery	
Are foot baths containing disinfectant placed at the incubation facility's entrance and exit?				✓	Inspection of facilities/Discussion	Install foot baths in incubation facilities
Is equipment and rain gear utilized in broodstock handling or spawning sanitized prior to its use elsewhere in the hatchery?	✓				Spawning at Wells Hatchery	
Is equipment used to collect dead fish sanitized prior to its use in another pond and/or lot of fish?				✓	Inspection of facilities/Discussion	Follow IHOT requirements for disinfection of equipment used to collect dead prior to its use in another pond
Is equipment, including vehicles used to transfer fish between facilities, disinfected prior to use with any other fish lots or at any other location?		✓			Inspection of facilities/Discussion	
Are rearing vessels sanitized after fish are removed and prior to introducing a new fish lot or stock?		✓			Inspection of facilities/Discussion	
Are dead fish properly disposed of?		✓			Inspection of facilities/Discussion	

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
water quality parameters being followed?						
Are the following water quality parameters within criteria? (PM #5a-5g)						
Water temperature			✓		No information provided	See PM #5a
Dissolved gases			✓		See above	See PM #5b
Chemistry			✓		See above	See PM #5c
Turbidity			✓		See above	See PM #5d
Alkalinity and hardness			✓		See above	See PM #5e
Nitrite			✓		See above	See PM #5f
Contaminants			✓		See above	See PM #5g
io to PM #21						
incubation and rearing standards being followed?						
Are the incubation practices following the IHOT incubation criteria? (PM #18)		✓			Discussion	
Are the rearing practices following the IHOT criteria? (PM #19)			✓		No information provided	See PM #19
io to rearing practices PM #18-PM #19						
egg and fish transfer/release requirements met?		✓			Discussion	

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
<p>Is the hatchery's program outlined in a subbasin management plan?</p> <p>Refer to subbasin plan PM #1</p>		✓			Columbia Basin System Planning Production Plan and FERC license for Rocky Reach Dam	
<p>Is the hatchery operating under a current hatchery operational plan?</p> <p>Refer to operational plan PM #2</p>		✓			Review of IHOT Operations Plan. However, not used at hatchery.	
<p>Is hatchery monitoring and evaluation plan in place?</p> <p>Refer to hatchery monitoring and evaluation plan PM #3</p>				✓	No information supplied	See PM #3

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
<p>Does the hatchery program meet requirements established in the regional hatchery policies and basin planning documents in the following areas: species, stock, broodstock collection location, broodstock numbers, broodstock collection strategy, spawning and egg-take protocols?</p> <p>Does the hatchery program meet the requirements for the following?</p>						
Species protocols (PM #4a)		✓			Review of records/Discussion	
Stock protocols (PM #4a)		✓			Review of records/Discussion	
Broodstock collection location protocols (PM #41b)	✓				Broodstock collection and spawning at Wells Hatchery	
Broodstock numbers protocols (PM #42c)	✓				See above	
Broodstock collection strategy protocols (PM #41b-d)	✓				See above	
Spawning protocols (PM #42d-e)	✓				See above	
Egg-take protocols (PM #42f-g)	✓				See above	

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
Do the hatchery's performance meet requirements defined in the regional hatchery policies and in the subbasin and hatchery plans for the following areas: percent smoltification, rearing density, disease condition, and the number, size date(s), and location of release?						
Percent smoltification (PM #22a1)	✓				Not released from this hatchery	
Rearing density (PM #22a2)			✓		No information provided	See PM #22a2
Disease condition (PM #22a3)	✓				Not released from this hatchery	
Number at release (PM #22a4)	✓				See above	
Size at release (PM #22a5)	✓				See above	
Date of release (PM #22a6)	✓				See above	
Location of release (PM #22a7)	✓				See above	
Are fish reared in the subbasin or acclimated in the subbasin?	✓				Not released from this hatchery	
PM #22b						
Is the release strategy appropriate for the program?	✓				Not released from this hatchery	
PM #22c						

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
<p>new programs, has a broodstock collection plan developed?</p> <p>Is the broodstock collection plan written?</p> <p>For a non-captive broodstock program:</p> <p>Was an unbiased, representative sample collected?</p> <p>Was the recommended number of broodstock collected?</p> <p>For a captive broodstock program:</p> <p>Were captive brood progeny excluded as donors for propagating the next generation of the captive broodstock program?</p> <p>Were full-sib crosses avoided?</p> <p>Is the broodstock collection plan understood and being followed by staff?</p>	<p>✓</p> <p>✓</p> <p>✓</p> <p>✓</p> <p>✓</p> <p>✓</p>				<p>Existing Program; does not apply</p>	
<p>a new program, was the donor selection outline followed in selecting the hatchery broodstock?</p> <p>Is a donor selection plan written?</p> <p>Was the donor selection outline followed in selecting the broodstock?</p> <p>Was the target stock recommended in the donor selection process actually used?</p>	<p>✓</p> <p>✓</p> <p>✓</p>				<p>Existing Program; does not apply</p> <p>Existing Program; does not apply</p> <p>Existing Program; does not apply</p>	

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
<p>existing programs, were the broodstock collection procedures followed?</p> <p>Is the broodstock collection plan written?</p> <p>Does the broodstock collection plan follow the guideline:</p> <p> Was an unbiased, representative sample collected?</p> <p> Was the recommended number of broodstock collected?</p> <p> Were the broodstock collection procedures in hatchery operation plan understood and followed?</p>	<p>✓</p> <p>✓</p> <p>✓</p> <p>✓</p>				<p>Broodstock collected at Wells Hatchery</p> <p>See above</p> <p>See above</p> <p>See above</p> <p>See above</p>	

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
Are the appropriate number of spawners, male/female ratios, and fertilization protocols used?						
Are the spawning protocols written?	✓				Spawning at Wells Hatchery	
Are daily or weekly spawning logs available?	✓				See above	
Was the appropriate number of spawners used?	✓				See above	
Did you attempt to spawn all collected broodstock and randomize mating with respect to age class, and other traits?	✓				See above	
Was the sex-ratio within the limits given in the performance standards?	✓				See above	
Were the fertilization protocols followed?	✓				See above	
If the hatchery needed to reduce the number of eggs retained, was this done by representative sampling of each male/female cross?	✓				See above	

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
<p>Where is a genetics monitoring and evaluation program in place?</p> <p>Is a genetics monitoring and evaluation program available?</p> <p>Does the plan address the following elements listed in HOT:</p> <p>Does the program have elements needed to meet evaluation goals 1-4?</p> <p>Has a qualified geneticist reviewed and endorsed the program (goal 5)?</p> <p>Will the program collect the data and maintain the records needed to evaluate compliance on an ongoing basis (goal 5)?</p> <p>Is the program understood and followed by staff?</p>				<p>✓</p> <p>✓</p> <p>✓</p> <p>✓</p> <p>✓</p>	<p>None provided</p> <p>See above</p> <p>See above</p> <p>See above</p> <p>See above</p>	<p>Develop approved genetics monitoring and evaluation program</p> <p>See above</p> <p>See above</p> <p>See above</p> <p>See above</p>

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 Chelan Hatchery - Summer Steelhead

This section presents the corrective actions required to bring the Chelan Hatchery - Summer Steelhead program into compliance with IHOT performance measures. The remedial actions suggested here are just that, suggestions developed by the Montgomery Watson Audit Team. 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 ($\pm 40\%$).

More importantly, 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.

Remedial Action Required	Cost	PMs¹
Type 3 - Remedial actions requiring changes in monitoring coverage or interval		
Document compliance with IHOT DO and TGP criteria	----	5b
Run analysis for water chemistry parameters, turbidity, alkalinity, hardness, nitrite, and contaminants	----	5c-5g
Type 4 - Remedial actions requiring significant capital expenditures		
Install security alarms	\$5,000	6
Install telephone pages	\$5,000	6
Construct 4 more 10' x 100' x 4" concrete raceways	\$260,000	9
Type 5 - Remedial actions that may require significant capital expenditures but are not clearly definable at this time		
None	----	

¹ PMs are performance measures that were extracted from the IHOT 1995 report. The IHOT performance measures are listed in Table 2 (Section 3 of this report) in numerical order.

Hatchery Contribution to Fisheries, Spawning Grounds, and Hatcheries

This section presents the audit findings for the Chelan Hatchery - Summer Steelhead program contribution of adult fish to fisheries, local fisheries, spawning grounds, and hatcheries. 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:
Chelan Hatchery - Summer Steelhead**

Year	Fisheries ¹ (Broodyear)	Spawning Grounds ¹ (Broodyear)	Hatchery ¹ (Broodyear)	Total Combined Contribution ² (Broodyear)	Smolt to Adult Survival (percent)
1982					
1983					
1984					
1985					
1986					
1987	See Turtle Rock Hatchery	See Turtle Rock Hatchery	See Turtle Rock Hatchery	See Turtle Rock Hatchery	See Turtle Rock Hatchery
1988	See Turtle Rock Hatchery	See Turtle Rock Hatchery	See Turtle Rock Hatchery	See Turtle Rock Hatchery	See Turtle Rock Hatchery
1989	See Turtle Rock Hatchery	See Turtle Rock Hatchery	See Turtle Rock Hatchery	See Turtle Rock Hatchery	See Turtle Rock Hatchery
1990	See Turtle Rock Hatchery	See Turtle Rock Hatchery	See Turtle Rock Hatchery	See Turtle Rock Hatchery	See Turtle Rock Hatchery
1991	See Turtle Rock Hatchery	See Turtle Rock Hatchery	See Turtle Rock Hatchery	See Turtle Rock Hatchery	See Turtle Rock Hatchery
1992					

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

² 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. Table 5 shows the annual operating expenses for the Chelan Hatchery - Summer Steelhead program. For programs that occur at more than one facility (as shown on Table 1 in Section 3 of this report), the cost breakdown for the component(s) at each facility is presented in separate tables (Table 5).

Table 5. Annual Operating Expenses: Chelan Hatchery - Summer Steelhead

Hatchery	1994	1995	1996
1. Chelan Hatchery	No information provided	No information provided	No information provided
2.			
3.			
4.			
5.			
Total Program Costs	See Turtle Rock Hatchery	See Turtle Rock Hatchery	See Turtle Rock Hatchery

The total expenditures for the Chelan Hatchery are presented in Table 6 by program. The detailed breakdown of program expenditures at this hatchery are presented in separate tables (Tables 6a).

Table 6. Annual Operating Expenses - Chelan Hatchery

Program	1994	1995	1996
1. Summer Steelhead	No information provided	No information provided	No information provided
2.			
3.			
4.			
5.			
Total Hatchery Costs	No information provided	No information provided	No information provided

**Table 5a. Annual Operating Expenses: Chelan Hatchery - Summer Steelhead
Expenditure Occurring at Chelan Hatchery**

Component	1994	1995	1996
Personnel Costs			
Operational Costs			
Capital Costs			
Indirect Costs			
Lumped Hatchery Costs ¹			
Lumped Third-Party Costs			\$11,816
Total Hatchery Costs	No information provided	No information provided	No information provided
Source of Funds			
Program Production (lb)			
Total Production (lb)			
Program as Percent of Total			
Program Costs	No information provided	No information provided	No information provided

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

Table 6a. Detailed Expenditures at Chelan Hatchery by Program

Summer Steelhead

Component	1994	1995	1996
Personnel Costs			
Operational Costs			
Capital Costs			
Indirect Costs			
Lumped Hatchery Costs ¹			
Lumped Third-Party Costs			\$11,816
Total Hatchery Costs	No information provided	No information provided	No information provided
Source of Funds			
Program Production (lb)			
Total Production (lb)			
Program as Percent of Total			
Program Costs	No information provided	No information provided	No information provided

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