HATCHERY EVALUATION REPORT

Clackamas Hatchery - Winter Steelhead (Eagle Creek Stock)

December 1996

Integrated Hatchery Operations Team (IHOT)

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

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Section 1

Executive Summary

This report presents the findings of the independent audit of the Clackamas Hatchery - Winter Steelhead program. Clackamas Hatchery is located on the Clackamas River, approximately 5 miles west of Estacada, Oregon. Clackamette Cove net pens, Marmot Ponds, and Hublou net pens are operated as satellite facilities to Clackamas Hatchery. The hatchery is used for adult collection, egg incubation, and rearing of spring chinook and the rearing of winter 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.

Clackamas Hatchery - Winter Steelhead (Eagle Creek Stock) Results

The Clackamas facility includes three ponds for adult holding, 10 concrete raceways, 3 rearing ponds, and incubation facilities. Clackamas Hatchery began operation in 1979 and is operated from four funding sources: ODFW, NMFS, Portland General Electric, and the City of Portland. The NMFS funding is part of the Columbia River Fisheries Development Program (Mitchell Act) - a program to enhance declining fish runs in the Columbia River Basin. Portland General Electric and City of Portland provide funding as mitigation for fishery losses caused by hydroelectric development in the Sandy and Clackamas river systems.

The Clackamas Hatchery - Winter Steelhead program was in general compliance with most of the performance measures. In the area of program objectives, the hatchery needed to improve its fry-to-smolt survival and document its adult contribution. The audit found that the hatchery was not in compliance the temperature criteria for rearing, water quality monitoring requirements, alarm requirements, predation control requirements, and regional feed preparation oversight, which are all facilities requirements. The hatchery needs to provide rearing in the subbasin or acclimation for Sandy subbasin releases. The hatchery needed to develop specific rearing standards for the IHOT Operations Plan, smoltification goal and monitoring plan, and follow IHOT disinfection protocols for transport vehicles. The hatchery did not have a Genetics Monitoring and Evaluation Program in place.

The specific areas in which the Clackamas Hatchery - Winter 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 fish contribution studies
- Conduct IHOT QA/QC for feed preparation
- Determine if design of release lines and manhole subjects fish to adverse conditions
- Develop alarm log
- Develop genetics and M & E program
- Develop smoltification goal and monitor
- Develop specific rearing standards for IHOT Operations Plan
- Document adult contribution
- Follow IHOT protocols for disinfection of exterior and interiors of transport vehicles
- Follow IHOT transportation protocols for water temperature; provide heating and cooling capabilities on transport trucks
- Implement IHOT recommendations for alarm monitoring and checking
- Improve fry-to-smolt survival by disinfecting water supply or prophylactic treatment
- Install outside systems and buzzers in onsite residences
- Monitor TGP
- Provide bird netting on A ponds

- Provide chilling to approximately 19,900 gpm and/or disinfect
- Provide rearing or acclimation for fish released in Sandy subbasin
- 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.

Section 2

Facility Description

Name: Clackamas Hatchery

Stock/Species: Spring Chinook
Winter Steelhead (Eagle Creek Stock)
Winter Steelhead (Clackamas Stock)

Operating Agency: Oregon Department of Fish & Wildlife

Funding Agency: Mitchell Act, ODFW, Portland General Electric, and City of Portland

Location: Clackamas Hatchery is located on the Clackamas River, approximately 5 miles west of Estacada, Oregon. Clackamette Cove net pens, Marmot Ponds, and Hublou net pens are operated as satellite facilities to Clackamas Hatchery.

Address: Clackamas Hatchery
Oregon Department of Fish & Wildlife
24500 S. Entrance Rd.
Estacada, OR 97023

Hatchery Manager: Mr. Mel Kelly

Phone: (503) 630-7210
Fax: (503) 630-4566

Purpose: Clackamas Hatchery began operation in 1979 and is operated from four funding sources: ODFW, NMFS, Portland General Electric, and the City of Portland. The NMFS funding is part of the Columbia River Fisheries Development Program (Mitchell Act) - a program to enhance declining fish runs in the Columbia River Basin. Portland General Electric and City of Portland provide funding as mitigation for fishery losses caused by hydroelectric development in the Sandy and Clackamas river systems.

Production Goal:

Spring Chinook

Provide 1,781,000 eggs of ODFW hatcheries and the Salmon and Trout Enhancement Program.

Produce 976,670 smolts (98,880 lb) for on-station releases into the Clackamas River.

Produce 50,000 smolts (5,000 lb) for release into the Clackamas River

from the Clackamette Cove net pens

Produce 30,000 smolts (3,000 lb) for release into the Clackamas River from the Hublou Harbor net pens

Produce 360,000 smolts (41,110 lb) for release into the Sandy River.

Produce 100,000 smolts (10,000 lb) for release into Sandy River from the Marmot acclimation pond.

Winter Steelhead

Produce 30,000 smolts (5,000 lb) for on-station releases into the Clackamas River.

Produce 30,000 smolts (5,000 lb) for release into the Sandy River.

Water Supply:

Water rights total 44,354 gpm form the Clackamas River and a well. The Clackamas River provides the majority of water used for hatchery operations.

Facilities:

Adult Holding:	3 concrete adult holding ponds - 5,040 cf each
Incubation:	20 16-tray stacks
Early Rearing:	2 Canadian troughs - 28 cf each
Raceways:	10 concrete raceways - 4,080 cf each
Rearing Ponds:	3 asphalt/concrete rearing ponds - 67,500 cf each
Satellite Facilities:	Clackamette Cove net pens
	Hublou net pens
	Marmot Ponds

Section 3
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.

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

This process consisted of research and onsite visits. The site visit at the Clackamas Hatchery was conducted on October 7, 1996.

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 Clackamas Hatchery - Winter 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 Clackamas Hatchery - Winter 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 Clackamas Hatchery - Winter Steelhead (Eagle Creek Stock)

Component	Location of Adult Holding, Spawning, Incubation, and Rearing					
	Clackamas Hatchery	Eagle Creek NFH				
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 nagement plan?		✔			Columbia Basin System Planning Production Plan and Clackamas Subbasin Plan	
ıe hatchery operating under a current hatchery rational plan? s it understood by staff? s it being followed?		✔ ✔ ✔			IHOT Operations Plan and Clackamas Operations Plan	
hatchery monitoring and evaluation plan in place?)o you have a written monitoring and evaluation plan?		✔			Hatchery monitoring and Evaluation Plan	
ılt contribution to fisheries, spawning grounds, and :hery				✔	Review of records. No data for Winter Steelhead	Document adult contribution
ılt pre-spawning survival as compared with ıblished goal	✔				Held at Eagle Creek Hatchery	
-take as compared with established hatchery goal	✔				Spawning at Eagle Creek Hatchery	
en-egg to eyed-egg survival as compared with ıblished goal	✔				Incubation at Eagle Creek Hatchery	
d-egg to fry survival as compared with established l	✔				Early rearing at Eagle Creek Hatchery	
to smolt survival as compared with established goal	✔				Reported at Eagle Creek Hatchery.	
duction as compared with established goal		✔			Review of records; in compliance 4 out of last 4 years	
cent survival (smolt to adult) as compared with ıblished goal			✔		No data. Not part of CWT fishery recovery program	Develop monitoring program to determine adult returns
nber of eggs, fry, fingerlings, smolts, and/or adults ıeet basinwide needs	✔				Review of records/Discussion. Not a compliance-related PM	

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
nperature						
Does your water temperature meet the criteria for spawning?	✔				Review of records/Discussion. None on station	
Does your water temperature meet the criteria for ncubation?	✔				Review of records/Discussion. None on stations	
Does your water temperature meet the criteria for earing?	✔				None on station	
solved gases						
s the oxygen level near saturation?		✔			Review of records/Discussion	
s the dissolved nitrogen level less than saturation?			✔		Review of records/Discussion. No data	Monitor TGP
emistry						
mmonia (un-ionized)			✔		No data	Run the analysis for water chemistry parameters
Carbon Dioxide			✔		No data	See above
Chlorine			✔		No data	See above
H			✔		No data	See above
Copper			✔		No data	See above
Hydrogen Sulfide			✔		No data	See above
ron			✔		No data	See above
inc			✔		No data	See above
bidity						
Does your turbidity meet the criteria?			✔		Review of records/Discussion. Well water OK. River supply is turbid	Run analysis

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
alinity and hardness						
Does your alkalinity and hardness meet the criteria?			✔		No data	Run the analysis
rite						
Does your nitrite meet the criteria?			✔		No data	Run the analysis
Contaminants						
ldrin			✔		No data	Run the analyses
ndrin			✔		No data	See above
Dieldrin			✔		No data	See above
Heptachlor			✔		No data	See above
Chlordane			✔		No data	See above
Methoxychlor			✔		No data	See above
indane			✔		No data	See above
Malathion			✔		No data	See above
Guthion			✔		No data	See above
hogens						
What portions of the hatchery have disease-free water?						
Adult holding	✔				Not on station	
Incubation	✔				Not on station	
Early rearing	✔				Not on station	
Rearing				✔	Inspection of facilities/Discussion	Disinfect supply to improve rearing survival through control of periodic disease outbreaks
Others				✔	Inspection of facilities/Discussion	See above

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
rm Systems						
)o the following areas have alarms?						
Intake		✔			Inspection of facilities/Discussion	
Large rearing ponds and adult holding ponds		✔			Inspection of facilities/Discussion	
Raceway headboxes and rearing ponds		✔			Inspection of facilities/Discussion	
Incubation facilities		✔			Inspection of facilities/Discussion	
Quarantine areas and facilities	✔				None on station	
Water treatment systems		✔			Inspection of facilities/Discussion	
Security				✔	Inspection of facilities/Discussion	Install security alarms
ıre there outside systems and buzzers in onsite esidences?				✔	Discussion	Install outside systems and buzzers in onsite residences
ıre water flow alarms checked daily?		✔			Review of records/Discussion	
ıre all other alarms checked weekly?				✔	Discussion	Implement IHOT recommendation for checking/monitoring alarms
; there a log of alarms for emergencies, tests, and ıaintenance requirements?				✔	Review of records/Discussion	Develop alarm log
ıre telephone pagers used?		✔			Discussion	
ılt collection and holding facilities						
)o you meet the adult holding criteria?	✔				Adults held at Eagle Creek Hatchery	

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
ıbation facilities						
'ype 1: N/A)o you have an adequate number of units for the verall program?	✔				No incubation of Winter Steelhead at Clackamas	
'ype 2:N/A)o you have an adequate number of units for the verall program?	✔					
ıring facilities						
'ype 1: Concrete Raceways (A ponds))o you have an adequate number of units for the verall program?		✔			Could use new pipeline to supply 5-unusual raceways. However, production goals are met	
'ype 2: _____)o you have an adequate number of units for the verall program?	✔					
'ype 3: _____)o you have an adequate number of units for the verall program?	✔					
eening facilities						
)o you meet the approach velocity criteria?		✔			Inspection of facilities/Discussion	
ıre the fish screens regularly cleaned?		✔			Inspection of facilities/Discussion	
)oes the screen mesh meet screen opening criteria?		✔			Inspection of facilities/Discussion	
ıre rearing containers double screened for fish that hould not be released to adjacent water?	✔				All winter Steelhead release to Clackamas River or Sandy River. Same stock	
dator control facilities						
ıre your predation control facilities effective?				✔	Inspection of facilities/Discussion. No bird screening on A ponds	Provide bird screening on A ponds

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						
)oes the storage of dry/semi-moist/moist foods dry<12%; semi-moist 12-20%; moist >20% moisture) ollow food manufacturer's recommendations?		✔			Inspection of facilities/Discussion	
)oes a regional quality control officer oversee roduction procedures and monitor:						
Verification by feed manufacturer that ingredients meet specifications?				✔	Discussion	Conduct IHOT QA/QC for feed preparation
Ensure feed does not contain unwanted drugs or other additives?				✔	Discussion	See above
Analyze ingredients contained in the final food product to ensure that feed specifications have been met?				✔	Discussion	See above
ıre the foods stored and handled according to the ollowing 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).	✔				Hand feed winter Steelhead raceways. Only remove amount needed for freezer	

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
ease facilities						
)o the release facilities ensure that fish are not ubjected to adverse conditions?			✔		Inspection of facilities/Discussion	Determine if release line and manifold connections subject fish to adverse conditions
lution abatement facilities						
)o the pollution abatement facilities meet all federal nd state regulations (or good engineering practice)?		✔			Inspection of facilities/Discussion	
re pollution abatement facilities operated correctly?		✔			Discussion	
nsportation facilities						
re the transport systems adequate to meet IHOT erformance 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		
odstock selection practices						
s the donor selection process document attached? (PM 40a)	✔				Existing program; does not apply	
Was the donor selection outline followed in selecting ne hatchery broodstock? (PM #40b-c)	✔				Existing program; does not apply	
wning practices						
Were the appropriate number of spawners, male/female atios, and fertilization protocols used? (PM #42c-g)	✔				Spawning at Eagle Creek Hatchery. Will determine compliance there	
ıbation practices						
specific incubation standards listed in the hatchery rations plan?	✔				Incubation occurs at Eagle Creek Hatchery. Will determine compliance there	
incubation practices written?	✔				See above	
ıbation Type 1: N/A(see PM #8) you meet the loading and flow criteria?	✔				See above	
ıbation Type 2: N/A (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		
ring practices						
specific rearing standards listed in the hatchery rations plan?		✔			Review IHOT Hatchery Operations Plan and Clackamas Hatchery Operations Plan	Develop specific rearing standards for IHOT Operations Plan
rearing practices written?		✔			Review Hatchery Operations Plan	
earing Unit Type 1: A ponds (see PM #9)						
Do you meet the density and DI criteria?		✔			Review of records/Discussion	
Do you meet the Loading and FI criteria?		✔			Review of records/Discussion	
earing Unit Type 2: N/A (see PM #9)						
Do you meet the density and DI criteria?	✔					
Do you meet the Loading and FI criteria?	✔					
earing Unit Type 3: N/A (see PM #9)						
Do you meet the density and DI criteria?	✔					
Do you meet the Loading and FI criteria?	✔					
olt quality						
Do you produce a high quality smolt?		✔			Discussion	

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
health management practices						
re the monthly hatchery monitoring visits being onducted? (PM #26)		✔			Review of records/Discussion	
re the annual broodstock inspections being conducted? PM #27)		✔			Review of records/Discussion	
there pathogen-free water and are the sanitation rocedures being followed? (PM #28)	✔				Incubation and early rearing at Eagle Creek Hatchery	
re the following water quality parameters within riteria? (PM #5a-5g)						
Water temperature				✔	Exceed temperature criteria	See #5a
Dissolved gases			✔		No data for TGP	See #5b
Chemistry			✔		No data	See #5c
Turbidity			✔		No data	See #5d
Alkalinity and hardness			✔		No data	See #5e
Nitrite			✔		No data	See # 5f
Contaminants			✔		No data	See #5g
re rearing standards being followed? (PM #19)		✔			Review of records/Discussion	
re 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		
s hatchery performance meet requirements lined in the regional hatchery policies and in basin and hatchery plans for the following areas?						
cent smoltification						
Do you measure percent smoltification?				✔	Discussion. Do not measure smoltification, release at 6/lb	Develop smoltification goal and monitor
Did you meet the smoltification criteria?			✔		Meet goal of release at 6/lb	See above
ring density (prior to release)						
Did you meet the rearing density criteria just prior to elease?		✔			Review of records/Discussion	
ease condition (at release)						
Did you meet all disease regulations just prior to elease?		✔			Review of records/Discussion	
nber (at release)						
Did you meet the release number goal?		✔			Review of records/Discussion. In compliance 2 out of 2 years	Provide chilling or disinfection to improve survival during rearing
at release						
Did you meet the size goal?		✔			Review of records/Discussion	
es of release						
Did you meet the release date goal?		✔			Review of records/Discussion	
ation of release						
Did you release the fish at the specified location?		✔			Review of records/Discussion	
fish reared in the subbasin or acclimated in the basin?						
are the fish reared in the subbasin?				✔	Sandy subbasin releases are neither reared or acclimated in subbasin	Provide rearing and acclimation for winter Steelhead in Sandy subbasin
are the fish acclimated in the subbasin?				✔	See above	See above
he release strategy appropriate for the program?				✔	Discussion	See PM#22b

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
nsportation facilities						
)o transportation equipment and personnel receive isinfection before and after use?		✔			Discussion	
s the fish tank interior disinfected using a solution of 00 ppm active chlorine for 30 minutes minimum or ormaldehyde gas generation method (relative humidity f 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 transport protocols for exterior and interior vehicle disinfection
s the fish transport vehicle (cab) disinfected using 600 pm quaternary ammonia compounds (1.5 ml of 50% tock solution/liter water)?				✔	Discussion	See above
s other equipment disinfected including fish pumps, ets, egg sorters, waders, boots, rain gear, hoses and ther equipment using one of the following solutions?		✔			Discussion	
200 ppm chlorine for 30 minutes 600 ppm quaternary ammonia compound for 30 minutes 200 ppm iodophor solution for 10 minutes		✔			Discussion	
)o personnel wear protective garments when handling sh eggs or cultural water?		✔			Discussion	
)o the fish transport truck/chassis and tank/unit receive n inspection and service prior to the release season?		✔			Discussion	
s a daily service inspection completed before starting p 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		
nsportation facilities						
)oes the fish transport unit receive an inspection prior) loading?		✔			Discussion	
)oes a pre-loading inspection covering tank water evel, pumps or aerators, oxygen injection system ettings, displacement gauge, and truck loading/hauling ensity tables checked and reviewed occur prior to)ading fish in the transport unit?		✔			Discussion	
)o hauling criteria include checking the fish 45 minutes) 1 hour after loading?		✔			Discussion	
Vhen fish are active and systems are functioning roperly, is the oxygen concentration reduced and ıaintained at approximately 8 ppm?					Discussion	
; water temperature in the transportation unit ıaintained within the 42-48 °F range?				✔	Discussion. Ambient water can b e > or < than criteria	Provide capability to heat or chill water on transport trucks
)o fish releasing procedures include the following riteria?		✔				
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		
luation practices						
las the hatchery conducted fishery contribution studies):						
Determine the requirements for evaluating and improving management programs?				✔	Discussion	Conduct fishery contribution studies
Develop guidelines that define the geographical area and identify component stocks (hatchery and/or wild) that comprise the management unit?				✔	Discussion. Steelhead are fin-clipped, not tagged	See above
Develop guidelines that define if the proper stocks of fish are currently being used?				✔	Discussion. No studies ongoing to determine fishery contribution	See above
Determine which management units contribute to a specific fishery and the time periods of those contributions?				✔	Discussion	See above
Determine the relative contributions of the various management units to a specific fishery over the different time periods?				✔	Discussion. Previous CREEL censuses no longer done	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		
monthly hatchery monitoring visits being ducted by a qualified fish health specialist as cribed below?						
Conduct visit at least monthly		✔			Review of records/Discussion.	
Monitoring conducted by qualified fish health specialist		✔			See above	
Examine a representative sample of healthy and moribund fish from each lot.		✔			See above	
Review fish culture practices with hatchery manager.		✔			See above	
Report finding and results of necropsies on standard form.		✔			See above	
Recommend appropriate drug or chemical treatment.		✔			See above	
Summarize fish health status or stock prior to release or transfer to another facility.		✔			See above	
all of the functions of the hatchery yearly nitoring visits being completed as described below?						
Annually examine each broodstock for the presence of reportable viral pathogens.	✔				At Eagle Creek	
Annually screen each salmon broodstock for the resence of *Renibacterium salmoninarum*.	✔				See above	
Conduct inspection by or under the supervision of ualified fish health specialist.	✔				See above	

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
ıe hatchery following accepted sanitation cedures?						
ıre there any sources of pathogen-free water, especially ɔr incubation and early rearing?	✔				Incubation and early rearing for this stock occurs at Eagle Creek Hatchery	
ıre the hatchery sanitation procedures understood and eing followed as described below?						
Disinfect/water harden eggs in iodophor?	✔				See above	
Are foot baths containing disinfectant placed at the incubation facility's entrance and exit?	✔				See above	
Is equipment and rain gear utilized in broodstock handling or spawning sanitized prior to its use elsewhere in the hatchery?	✔				See above	
Is equipment used to collect dead fish sanitized prior its use in another pond and/or lot of fish?		✔			Inspection of facilities/Discussion.	
Is equipment, including vehicles used to transfer fish between facilities, disinfected prior to use with any other fish lots or at any other location?		✔			See above	
Are rearing vessels sanitized after fish are removed and prior to introducing a new fish lot or stock?		✔			See above	
Are dead fish properly disposed of?		✔			Inspection of facilities/Discussion. Landfilled	

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?						
re the following water quality parameters within riteria? (PM #5a-5g)						
Water temperature				✔	Review of records/Discussion. July - August exceed 60F	See # 5a
Dissolved gases			✔		No data	See #5b
Chemistry			✔		No data	See # 5c
Turbidity			✔		No data	See #5d
Alkalinity and hardness			✔		No data	See # 5e
Nitrite			✔		No data	See #5f
Contaminants			✔		No data	See #5g
o to PM #21						
incubation and rearing standards being followed?						
Are the incubation practices following the IHOT incubation criteria? (PM #18)	✔				Review of records/Discussion. No incubation on station	
Are the rearing practices following the IHOT criteria? (PM #19)		✔			Review of records/Discussion	
o 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		
ne hatchery's program outlined in a subbasin nagement plan? Go to subbasin plan PM #1		✔			Columbia Basin System Planning Production Plan and Clackamas Subbasin Plan	
ne hatchery operating under a current hatchery rational plan? Go to operational plan PM #2		✔			Review IHOT Operations Plan and Clackamas Hatchery Plan	
hatchery monitoring and evaluation plan in place? Go to hatchery monitoring and evaluation plan PM #3		✔			M&E program described in Clackamas Subbasin Plan	

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
s the hatchery program meet requirements blished in the regional hatchery policies and basin planning documents in the following areas: cies, stock, broodstock collection location, odstock numbers, broodstock collection strategy, spawning and egg-take protocols?						
Does the hatchery program meet the requirements for he following?						
Species protocols (PM #4a)		✔			Review of records/Discussion	
Stock protocols (PM #4a)		✔			Review of records/Discussion	
Broodstock collection location protocols (PM #41b)		✔			Review of records/Discussion	
Broodstock numbers protocols (PM #42c)	✔				Spawning occurs at Eagle Creek Hatchery	
Broodstock collection strategy protocols (PM #41b-d)		✔			Review of records/Discussion	
Spawning protocols (PM #42d-e)	✔				Spawning occurs at Eagle Creek Hatchery	
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		
s the hatchery's performance meet requirements ined in the regional hatchery policies and in basin and hatchery plans for the following areas: cent smoltification, rearing density, disease dition, and the number, size date(s), and location of ase?						
ercent smoltification (PM #22a1)				✔	Review of records/Discussion	See PM # 22a1
earing density (PM #22a2)		✔			Review of records/Discussion	
)isease condition (PM #22a3)		✔			Review of records/Discussion	
Number at release (PM #22a4)				✔	Review of records/Discussion	See PM #22a4
ize at release (PM #22a5)		✔			Review of records/Discussion	
)ate of release (PM #22a6)		✔			Review of records/Discussion	
.ocation of release (PM #22a7)		✔			Review of records/Discussion	
fish reared in the subbasin or acclimated in the basin? PM #22b				✔	Sandy subbasin releases are not reared or acclimated in the subbasin	See PM #22b
ne release strategy appropriate for the program? PM #22c				✔	Discussion	See PM#22c

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

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
existing programs, were the broodstock collection cedures followed?						
s the broodstock collection plan written?		✔			Review of broodstock collection plan	
Does the broodstock collection plan follow the uideline:						
Was an unbiased, representative sample collected?		✔			Discussion	
Was the recommended number of broodstock collected?		✔			Discussion	
Were the broodstock collection procedures in hatchery operation plan understood and followed?		✔			Discussion	

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
s the appropriate number of spawners, male/female os, and fertilization protocols used?						
ıre the spawning protocols written?	✔				Spawning occurs at Eagle Creek Hatchery	
ıre daily or weekly spawning logs available?	✔				See above	
Vas the appropriate number of spawners used?	✔				See above	
)id you attempt to spawn all collected broodstock and ındomize mating with respect to age class, and other ·aits?	✔				See above	
Vas the sex-ratio within the limits given in the erformance standards?	✔				See above	
Vere the fertilization protocols followed?	✔				See above	
the hatchery needed to reduce the number of eggs etained, was this done by representative sampling of ach 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		
ıere a genetics monitoring and evaluation program lace?						
; a genetics monitoring and evaluation program vailable?				✔	Discussion	Develop genetics M&E program
)oes the plan address the following elements listed in HOT:						See above
Does the program have elements needed to meet evaluation goals 1-4?				✔	Discussion	See above
Has a qualified geneticist reviewed and endorsed the program (goal 5)?				✔	Discussion	See above
Will the program collect the data and maintain the records needed to evaluate compliance on an ongoing basis (goal 5)?				✔	Discussion	See above
Is the program understood and followed by staff?				✔	Discussion	See above

Section 4

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 Clackamas Hatchery - Winter Steelhead

This section presents the corrective actions required to bring the Clackamas Hatchery - Winter 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 (± 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.

Table 3. Remedial Actions Required at Clackamas Hatchery - Winter Steelhead

Remedial Action Required	Cost	PMs[1]
Type 1 - Non-compliance issues resulting from items beyond human control or Performance Measures not relevant for this hatchery		
Install security alarms	----	6
Type 2 - Remedial actions requiring changes in agency policies or procedures		
Document adult contribution	----	4a, 4h
Implement IHOT recommendations for alarm monitoring and checking	----	6
Develop alarm log	----	6
Conduct IHOT QA/QC for feed preparation	----	12
Develop specific rearing standards for IHOT Operations Plan	----	18-19
Develop smoltification goal and monitor	----	22a1
Follow IHOT protocols for disinfection of exterior and interiors of transport vehicles	----	23
Conduct fish contribution studies	----	24
Develop genetics and M & E program	----	43
Type 3 - Remedial actions requiring changes in monitoring coverage or interval		
Monitor TGP	----	5b
Run analysis for water chemistry parameters, turbidity, alkalinity, hardness, nitrite, and contaminants	----	5c-5g

[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.

Remedial Action Required	Cost	PMs[1]
Type 4 - Remedial actions requiring significant capital expenditures		
Improve fry-to-smolt survival by disinfecting entire facility water supply or prophylactic treatment	$25 Million	4f
Install outside systems and buzzers in 4 onsite residences	$20,000	6
Provide bird netting on A ponds	$5,000	11, 22a4
Determine if design of release lines and manhole subjects fish to adverse conditions	$25,000	13
Provide rearing or acclimation for fish released in Sandy subbasin	$1,000,000	22b
Follow IHOT transportation protocols for water temperature; provide heating and cooling capabilities on transport trucks	$25,000	23
Type 5 - Remedial actions that may require significant capital expenditures but are not clearly definable at this time		
Provide chilling to approximately 19,900 gpm and/or disinfect	----	5a, 5h, 22a4

[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.

Section 5

Hatchery Contribution to Fisheries, Spawning Grounds, and Hatcheries

This section presents the audit findings for the Clackamas Hatchery - Winter 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: Clackamas Hatchery - Winter Steelhead

Year	Fisheries[1] (Broodyear)	Spawning Grounds[1] (Broodyear)	Hatchery[1] (Broodyear)	Total Combined Contribution[2] (Broodyear)	Smolt to Adult Survival (percent)
1983					
1984					
1985	No Information Provided	No Information Provided	No Information Provided	No Information Provided	No Information Provided
1986	No Information Provided	No Information Provided	No Information Provided	No Information Provided	No Information Provided
1987	No Information Provided	No Information Provided	No Information Provided	No Information Provided	No Information Provided
1988	No Information Provided	No Information Provided	No Information Provided	No Information Provided	No Information Provided
1989	No Information Provided	No Information Provided	No Information Provided	No Information Provided	No Information Provided
1990					
1991					
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.

Section 6

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 Clackamas Hatchery - Winter 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 (Tables 5a and 5b).

Table 5. Annual Operating Expenses: Clackamas Hatchery - Winter Steelhead

Hatchery	**1994**	**1995**	**1996**
1. Clackamas	**$29,956**	**$29,956**	**$30,365**
2. Eagle Creek	**$122,245**	**$96,492**	**$113,335**
3.			
4.			
5.			
Total Program Costs	**$152,201**	**126,448**	**$143,700**

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

Table 6. Annual Operating Expenses - Clackamas Hatchery

Program	**1994**	**1995**	**1996**
1. Spring Chinook	**$469,316**	**$469,316**	**$506,079**
2. Winter Steelhead	**$29,956**	**$29,956**	**$30,365**
3.			
4.			
5.			
Total Hatchery Costs	**$499,272**	**$499,272**	**$506,079**

Table 5a. Annual Operating Expenses: Clackamas Hatchery - Winter Steelhead

Expenditure Occurring at Clackamas Hatchery

Component	1994	1995	1996
Personnel Costs	$185,598	$185,598	$182,944
Operational Costs	$238,451	$238,451	$246,968
Capital Costs	$0	$0	$0
Indirect Costs	$75,223	$75,223	$76,167
Lumped Hatchery Costs[1]			
Lumped Third-Party Costs			
Total Hatchery Costs	**$499,272**	**$499,272**	**$506,079**
Source of Funds			
Mitchell Act, ODFW, Portland General Electric, City of Portland			
Program Production (lb)	10,000	10,000	10,000
Total Production (lb)	171,336	171,336	171,336
Program as Percent of Total	5.8%	5.8%	5.8%
Program Costs	**$29,956**	**$29,956**	**$30,365**

[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 5b. Annual Operating Expenses: Clackamas Hatchery - Winter Steelhead

Expenditure Occurring at Eagle Creek NFH

Component	1994	1995	1996
Personnel Costs	$324,090	$333,993	$317,182
Operational Costs	$66,988	$97,045	$88,376
Capital Costs	$86,377	$39,081	$77,353
Indirect Costs			
Lumped Hatchery Costs[1]			
Lumped Third-Party Costs	$11,523	$12,341	$9,849
Total Hatchery Costs	$488,978	$482,460	$492,760
Source of Funds			
NMFS	**100%**	**100%**	**100%**
Program Production (lb)	46,061	46,913	33,441
Total Production (lb)	187,218	239,280	145,539
Program as Percent of Total	25%	20%	23%
Program Costs	$122,245	$96,492	$113,335

[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 Clackamas Hatchery by Program

Spring Chinook

Component	1994	1995	1996
Personnel Costs	$185,598	$185,598	$182,944
Operational Costs	$238,451	$238,451	$246,968
Capital Costs	$0	$0	$0
Indirect Costs	$75,223	$75,223	$76,167
Lumped Hatchery Costs[1]			
Lumped Third-Party Costs			
Total Hatchery Costs	**$499,272**	**$499,272**	**$506,079**
Source of Funds			
Mitchell Act, ODFW, Portland General Electric, City of Portland			
Program Production (lb)	161,111	161,111	161,111
Total Production (lb)	171,336	171,336	171,336
Program as Percent of Total	94%	94%	94%
Program Costs	**$469,316**	**$469,316**	**$475,714**

[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 6b. Detailed Expenditures at Clackamas Hatchery by Program

Winter Steelhead

Component	1994	1995	1996
Personnel Costs	$185,598	$185,598	$182,944
Operational Costs	$238,451	$238,451	$246,968
Capital Costs	$0	$0	$0
Indirect Costs	$75,223	$75,223	$76,167
Lumped Hatchery Costs[1]			
Lumped Third-Party Costs			
Total Hatchery Costs	**$499,272**	**$499,272**	**$506,079**
Source of Funds			
Mitchell Act, ODFW, Portland General Electric, City of Portland			
Program Production (lb)	10,000	10,000	10,000
Total Production (lb)	171,336	171,336	171,336
Program as Percent of Total	5.8%	5.8%	5.8%
Program Costs	**$29,956**	**$29,956**	**$30,365**

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