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# **HATCHERY EVALUATION REPORT**

**Leaburg Fish Hatchery - Summer Steelhead**

**January 1997**

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**Integrated Hatchery Operations Team (IHOT)**

# **HATCHERY EVALUATION REPORT**

## **Leaburg Fish Hatchery - Summer Steelhead**

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

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## Executive Summary

This report presents the findings of the independent audit of the Leaburg Fish Hatchery - Summer Steelhead program. The hatchery is located along the McKenzie River (Willamette Basin) approximately 23 mile east of Springfield Oregon. The hatchery is used for adult collection, incubation and 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.

### Leaburg Fish Hatchery - Summer Steelhead Results

The Leaburg facility includes 2 raceways for adult holding, 42 concrete raceways, 6 circular rearing ponds, 17 fiberglass Canadian troughs, and incubation facilities. The hatchery was constructed in 1953 by the U.S. Army Corps of Engineers to mitigate for lost trout habitat caused by construction of Blue River and Cougar Dams and other Willamette Valley projects.

The Leaburg Fish Hatchery - Summer Steelhead program was in general compliance with most of the performance measures. In the area of program objectives, the hatchery did not have a Monitoring and Evaluation Plan and needed to conduct a fisheries contribution study. The audit found that the hatchery was not in compliance with the water quality monitoring, alarm, food storage, and release facilities requirements, which are all facilities requirements. The hatchery was not meeting all the transportation protocols, and needed to develop a smoltification goal and monitoring program. The hatchery did not have a Genetics Monitoring and Evaluation Program.

The specific areas in which the Leaburg Fish 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 fish contribution study
- Conduct IHOT QA/QC tests for feed preparation
- Construct a new 4'W x 6'H x 100' L outlet channel
- Develop alarm log
- Develop approved genetics M&E plan
- Develop hatchery M&E plan to track Leaburg fish
- Develop smoltification goal and monitor
- Follow IHOT protocols for disinfection of transport vehicle interior and exterior
- Follow IHOT protocols for disinfection of transportation equipment and personnel before and after use
- Follow IHOT protocols for removing moist pellets just prior to feeding
- Follow IHOT protocols for tempering of liberation water prior to release
- Follow IHOT requirements for checking of the other alarms weekly
- Install security alarms
- Lower density by splitting fish to other ponds prior to release
- Monitor DO and TGP and record
- 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

<b>Name:</b>	Leaburg Fish Hatchery
<b>Stock/Species:</b>	Summer Steelhead
<b>Operating Agency:</b>	Oregon Department of Fish & Wildlife
<b>Funding Agency:</b>	Corps of Engineers
<b>Location:</b>	The hatchery is located along the McKenzie River (Willamette Basin) approximately 23 miles east of Springfield Oregon.
<b>Address:</b>	90700 Fish Hatchery Road Leaburg, OR 97489
<b>Hatchery Manager:</b>	Mr. Stephen Wells
<b>Phone:</b>	(541) 896-3294
<b>Fax:</b>	(541) 896-0447
<b>Purpose:</b>	The hatchery was constructed in 1953 by the U.S. Army Corps of Engineers to mitigate for lost trout habitat caused by construction of Blue River and Cougar Dams and other Willamette Valley projects. The goal of the hatchery is to help achieve an average sport catch of 1,200 adult summer steelhead in the McKenzie River.
<b>Production Goal:</b>	<b>Summer Steelhead</b>  Produce 108,000 smolts (24,000 lb) for release into the McKenzie River  Produce 115,500 smolts (11,550 lb) for transfer to Dexter Pond
<b>Water Supply:</b>	Water rights total 56,100 gpm from the McKenzie River. All rearing facilities use single-pass water.
<b>Facilities:</b>	
Adult Holding:	1 concrete raceway for adult capture - 7,320 cf
Incubation:	6 half stack vertical incubators (48 trays)  5 aluminum troughs - 11 cf each

Early Rearing: 13 Canadian troughs - 64 cf each  
4 Canadian troughs - 84 cf each

Raceways: 3 concrete raceways - 3,660 cf  
39 concrete raceways - 7,320 cf  
(The number of raceways includes those used for adult capture)

Rearing Ponds: 6 circular concrete ponds - 690 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).<sup>1</sup> 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.

<sup>1</sup>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 Leaburg Fish Hatchery was conducted on January 30, 1997.

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 Leaburg Fish 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 Leaburg Fish 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 Leaburg Fish Hatchery - Summer Steelhead**

Component	Location of Adult Holding, Spawning, Incubation, and Rearing					
	Leaburg Fish Hatchery	South Santiam Hatchery	Oak Springs Hatchery	Dexter Pond		
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 McKenzie subbasin plan	
is the hatchery operating under a current hatchery operational plan?		✓			IHOT Operations Plan and Leaburg Operations and Maintenance Manual	
is it understood by staff?		✓				
is it being followed?		✓				
is a hatchery monitoring and evaluation plan in place?						
do you have a written monitoring and evaluation plan?				✓	No CWT program for steelhead; all fish are adipose clipped	Develop M&E plan to track Leaburg fish
is there a hatchery contribution to fisheries, spawning grounds, and hatchery		✓			Review of records; ODF&W punch-card analysis.	
is adult pre-spawning survival as compared with established goal	✓				Do not hold adults	
is egg take as compared with established hatchery goal	✓				Do not spawn fish	
is hatchery egg to eyed-egg survival as compared with established goal	✓				Do not incubate eggs	
is hatchery eyed-egg to fry survival as compared with established goal	✓				Do not incubate eggs	
is hatchery fry to smolt survival as compared with established goal		✓			Review of records; in compliance 3 out of last 3 years	
is hatchery production as compared with established goal		✓			Review of records; in compliance 3 out of last 3 years	
is hatchery percent survival (smolt to adult) as compared with established goal		✓			Review of records; in compliance 3 out of last 3 years; ODF&W punch-card analysis.	
is hatchery 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		
<b>Temperature</b>						
Does your water temperature meet the criteria for spawning?	✓				Do not spawn fish	
Does your water temperature meet the criteria for incubation?	✓				Do not incubate eggs	
Does your water temperature meet the criteria for rearing?		✓			Review of records/Discussion	
<b>Dissolved gases</b>						
Is the oxygen level near saturation?			✓		No data	Monitor DO and record
Is the dissolved nitrogen level less than saturation?			✓		No data	Monitor TGP and record
<b>Chemistry</b>						
Ammonia (un-ionized)			✓		No data	Run analysis
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
Manganese			✓		See above	See above
<b>Turbidity</b>						
Does your turbidity meet the criteria?			✓		No data	Run analysis

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
<b>Alkalinity and hardness</b>						
Does your alkalinity and hardness meet the criteria?			✓		No data	Run analysis
<b>Nitrite</b>						
Does your nitrite meet the criteria?			✓		No data	Run analysis
<b>Pesticide Contaminants</b>						
Aldrin			✓		No data	Run analysis
Dieldrin			✓		See above	See above
Endrin			✓		See above	See above
Heptachlor			✓		See above	See above
Chlordane			✓		See above	See above
Methoxychlor			✓		See above	See above
Permethrin			✓		See above	See above
Malathion			✓		See above	See above
Parathion			✓		See above	See above
<b>Biological</b>						
What portions of the hatchery have disease-free water?						
Adult holding	✓				Do not hold adults on station Do not incubate on station No early rearing on station	None
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		
<b>Alarm Systems</b>						
Do 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	✓				No quarantine areas and facilities	
Water treatment systems	✓				No water treatment systems	
Security				✓	Inspection of facilities/Discussion	Install security alarm
Are there outside systems and buzzers in onsite residences?		✓			Discussion	
Are water flow alarms checked daily?		✓			Review of records/Discussion	
Are all other alarms checked weekly?				✓	Discussion	Follow IHOT requirements for checking of other alarms weekly
Is there a log of alarms for emergencies, tests, and maintenance requirements?				✓	Review of records/Discussion	Develop alarm log
Are telephone pagers used?		✓			Discussion	
<b>Adult collection and holding facilities</b>						
Do you meet the adult holding criteria?	✓				Do not hold brood stock	

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
<b>Incubation facilities</b>						
Type 1: _____ Do you have an adequate number of units for the overall program?	✓				Do not incubate	
Type 2: _____ Do you have an adequate number of units for the overall program?	✓				See above	
<b>Rearing facilities</b>						
Type 1: <u>Raceways (1-4)</u> Do you have an adequate number of units for the overall program?		✓			Inspection of facilities/Discussion	
Type 2: _____ Do you have an adequate number of units for the overall program?	✓				Inspection of facilities/Discussion	
Type 3: _____ Do you have an adequate number of units for the overall program?	✓				Inspection of facilities/Discussion	
<b>Feeding facilities</b>						
Do you meet the approach velocity criteria?		✓			Inspection of facilities/Discussion	
Are the fish screens regularly cleaned?		✓			Inspection of facilities/Discussion	
Does the screen mesh meet screen opening criteria?		✓			Inspection of facilities/Discussion	
Are rearing containers double screened for fish that should not be released to adjacent water?	✓				All steelhead can be released	
<b>Predator control facilities</b>						
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		
<b>d storage facilities and quality control</b>						
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	Conduct IHOT QA/QC tests 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
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	Follow IHOT protocols for removing moist pellets just prior to feeding
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).	✓				Do not use automatic feeders	

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
<b>Release facilities</b>  Do the release facilities ensure that fish are not subjected to adverse conditions?				✓	Inspection of facilities/Discussion	Construct a new 4'W x 6'H x 100'L outlet channel
<b>Pollution abatement facilities</b>  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	
<b>Transportation facilities</b>  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		
<b>Broodstock selection practices</b>						
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	
<b>Spawning practices</b>						
Were the appropriate number of spawners, male/female ratios, and fertilization protocols used? (PM #42c-g)	✓				Spawning occurs at South Santiam Hatchery	
<b>Incubation practices</b>						
Are specific incubation standards listed in the hatchery operations plan?	✓				Do not incubate at this hatchery	
Are incubation practices written?	✓				See above	
Incubation Type 1: _____ (see PM #8) do you meet the loading and flow criteria?	✓				See above	
Incubation Type 2: _____ (see PM #8) do you meet the loading and flow criteria?	✓				See above	

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
<b>rearing practices</b>						
specific rearing standards listed in the hatchery operations plan?		✓			Review IHOT Hatchery Operations Plan and Leaburg Hatchery Operations Manual	
rearing practices written?		✓			See above	
rearing Unit Type 1: <u>Raceways</u> (see PM #9) Do you meet the density and DI criteria? Do you meet the Loading and FI criteria?		✓ ✓			Review of records/Discussion Normally OK, but can exceed density criteria prior to release. See PM #22a2	
rearing Unit Type 2: _____ (see PM #9) Do you meet the density and DI criteria? Do you meet the Loading and FI criteria?	✓ ✓					
rearing Unit Type 3: _____ (see PM #9) Do you meet the density and DI criteria? Do you meet the Loading and FI criteria?	✓ ✓					
<b>smolt quality</b>						
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		
<b>Health management practices</b>						
Are the monthly hatchery monitoring visits being conducted? (PM #26)		✓			Review of records/Discussion	
Are the annual broodstock inspections being conducted? (PM #27)	✓				At South Satiam	
Is there pathogen-free water (PM #5h) and are the sanitation procedures being followed? (PM #28)		✓			Review of records/Discussion. Pathogen free water not needed. See PM #5h and #28.	
Are the following water quality parameters within criteria? (PM #5a-5g)						
Water temperature		✓			Review of records/Discussion	
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	
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		
<p><b>Do hatchery performance meet requirements defined in the regional hatchery policies and in basin and hatchery plans for the following areas?</b></p> <p><b>Percent smoltification</b></p> <p>Do you measure percent smoltification?  Do you have a smoltification goal  Did you meet the smoltification criteria?</p>			✓	✓ ✓	Discussion Discussion Discussion	Develop smoltification goal and monitor See above See above
<p><b>Rearing density (prior to release)</b></p> <p>Did you meet the rearing density criteria just prior to release?</p>				✓	Review of records/Discussion	Lower density by splitting fish to other ponds prior to release.
<p><b>Disease condition (at release)</b></p> <p>Did you meet all disease regulations just prior to release?</p>		✓			Review of records/Discussion	
<p><b>Release number (at release)</b></p> <p>Did you meet the release number goal?</p>		✓			Review of records/Discussion	
<p><b>Release size (at release)</b></p> <p>Did you meet the size goal?</p>		✓			Review of records/Discussion	
<p><b>Release dates (at release)</b></p> <p>Did you meet the release date goal?</p>		✓			Review of records/Discussion	
<p><b>Release location (at release)</b></p> <p>Did you release the fish at the specified location?</p>		✓			Review of records/Discussion	
<p><b>Subbasin acclimation (at release)</b></p> <p>Were the fish reared in the subbasin?  Were the fish acclimated in the subbasin?</p>		✓ ✓			Discussion Discussion	
<p><b>Release strategy appropriate for the program?</b></p>		✓			Discussion	

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
<b>Transportation facilities</b>						
Do transportation equipment and personnel receive disinfection before and after use?				✓	Discussion	Follow IHOT protocols for disinfection of transportation equipment and personnel before and after use
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 protocols for disinfection of transport vehicle interior and exterior
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		
<b>Transportation facilities</b>						
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	
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	Follow IHOT protocols for tempering of liberation water prior to release
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		
<b>Evaluation practices</b>						
Has the hatchery conducted fishery contribution studies?					Discussion	
Determine the requirements for evaluating and improving management programs?				✓	Discussion	Conduct fish contribution study
Develop guidelines that define the geographical area and identify component stocks (hatchery and/or wild) that comprise the management unit?				✓	Discussion	See above
Develop guidelines that define if the proper stocks of fish are currently being used?				✓	Discussion	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	See above

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
<b>ining practices</b>						
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		
<b>monthly hatchery monitoring visits being conducted by a qualified fish health specialist as described below?</b>						
Conduct visit at least monthly		✓			Review of records/Discussion	
Monitoring conducted by qualified fish health specialist		✓			Review of records/Discussion	
Examine a representative sample of healthy and moribund fish from each lot.		✓			Review of records/Discussion	
Review fish culture practices with hatchery manager.		✓			Review of records/Discussion	
Report finding and results of necropsies on standard form.		✓			Review of records/Discussion	
Recommend appropriate drug or chemical treatment.		✓			Review of records/Discussion	
Summarize fish health status or stock prior to release or transfer to another facility.		✓			Review of records/Discussion	
<b>all of the functions of the hatchery yearly monitoring visits being completed as described below?</b>						
Annually examine each broodstock for the presence of reportable viral pathogens.		✓			Review of records/Discussion	
Annually screen each salmon broodstock for the presence of <i>Renibacterium salmoninarum</i> .		✓			Review of records/Discussion	
Conduct inspection by or under the supervision of qualified fish health specialist.		✓			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><b>Are there any sources of pathogen-free water, especially for incubation and early rearing?</b></p> <p>Are the hatchery sanitation procedures understood and being followed as described below?</p> <p>Disinfect/water harden eggs in iodophor?</p> <p>Are foot baths containing disinfectant placed at the incubation facility's entrance and exit?</p> <p>Is equipment and rain gear utilized in broodstock handling or spawning sanitized prior to its use elsewhere in the hatchery?</p> <p>Is equipment used to collect dead fish sanitized prior its use in another pond and/or lot of fish?</p> <p>Is equipment, including vehicles used to transfer fish between facilities, disinfected prior to use with any other fish lots or at any other location?</p> <p>Are rearing vessels sanitized after fish are removed and prior to introducing a new fish lot or stock?</p> <p>Are dead fish properly disposed of?</p>				<p>✓</p>	<p>No incubation or early rearing . Not needed.</p> <p>No incubation on station</p> <p>No incubation on station</p> <p>No incubation on station</p> <p>Inspection of facilities/Discussion</p> <p>Inspection of facilities/Discussion</p> <p>Inspection of facilities/Discussion</p> <p>Inspection of facilities/Discussion</p>	<p>None</p>

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

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
<p><b>Is the hatchery's program outlined in a subbasin management plan?</b></p> <p>Refer to subbasin plan PM #1</p>		✓			Columbia Basin System Planning Production Plan and McKenzie subbasin plan	
<p><b>Is the hatchery operating under a current hatchery operational plan?</b></p> <p>Refer to operational plan PM #2</p>		✓			IHOT Operations Plan and Leaburg Operations and Maintenance Manual	
<p><b>Is hatchery monitoring and evaluation plan in place?</b></p> <p>Refer to hatchery monitoring and evaluation plan PM #3</p>				✓	No CWT program for steelhead; all fish are adipose clipped	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 #1)		✓			Review of records/Discussion	
Stock protocols (PM #1)		✓			Review of records/Discussion	
Broodstock collection location protocols (PM #41b for existing program; PM #39b for new program )	✓				Brood collection and spawning at S. Santiam Hatchery	
Broodstock numbers protocols (PM #42c)	✓				See above	
Broodstock collection strategy protocols (PM #41b-d for existing program; PM 39b-f for new program)	✓				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		
<b>Do the hatchery's performance meet requirements defined in the regional hatchery policies and in the basin and hatchery plans for the following areas: percent smoltification, rearing density, disease condition, and the number, size date(s), and location of release?</b>						
Percent smoltification (PM #22a1)				✓	Review of records/Discussion	See PM #22a1
Rearing density (PM #22a2)				✓	Review of records/Discussion	See PM #22a2
Disease condition (PM #22a3)		✓			Review of records/Discussion	
Number at release (PM #22a4)		✓			Review of records/Discussion	
Size at release (PM #22a5)		✓			Review of records/Discussion	
Date of release (PM #22a6)		✓			Review of records/Discussion	
Location of release (PM #22a7)		✓			Review of records/Discussion	
<b>Are fish reared in the subbasin or acclimated in the basin?</b>		✓			Discussion	
PM #22b						
<b>Is the release strategy appropriate for the program?</b>		✓			Discussion	
PM #22c						

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
<b>new programs, has a broodstock collection plan developed?</b>						
Is the broodstock collection plan written?	✓				Existing Program; does not apply	
For a non-captive broodstock program: Was an unbiased, representative sample collected?	✓				Existing Program; does not apply	
Was the recommended number of broodstock collected?	✓				Existing Program; does not apply	
For 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	
Is the broodstock collection plan understood and being followed by staff?	✓				Existing Program; does not apply	
<b>a new program, was the donor selection outline followed in selecting the hatchery broodstock?</b>						
Is a donor selection plan written?	✓				Existing Program; does not apply	
Was the donor selection outline followed in selecting the broodstock?	✓				Existing Program; does not apply	
Was the target stock recommended in the donor selection 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		
<p><b>existing programs, were the broodstock collection procedures followed?</b></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 South Santiam Hatchery</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		
<b>Are the appropriate number of spawners, male/female ratios, and fertilization protocols used?</b>						
Are the spawning protocols written?	✓				Spawning and fertilization at South Santiam 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><b>Where is a genetics monitoring and evaluation program available?</b></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 M&amp;E plan</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 Leaburg Fish Hatchery - Summer Steelhead

This section presents the corrective actions required to bring the Leaburg Fish 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.

**Table 3. Remedial Actions Required at Leaburg Fish Hatchery - Summer Steelhead**

<b>Remedial Action Required</b>	<b>Cost</b>	<b>PMS<sup>1</sup></b>
<b>Type 1</b> - Non-compliance issues resulting from items beyond human control or Performance Measures not relevant for this hatchery  None	----	
<b>Type 2</b> - Remedial actions requiring changes in agency policies or procedures		
Develop hatchery M&E plan to track Leaburg fish	----	3
Follow IHOT requirements for checking of the other alarms weekly	----	6
Develop alarm log	----	6
Conduct IHOT QA/QC tests for feed preparation	----	12
Follow IHOT protocols for removing moist pellets just prior to feeding	----	12
Develop smoltification goal and monitor	----	22a1
Lower density by splitting fish to other ponds prior to release.	----	22a2
Follow IHOT protocols for disinfection of transportation equipment and personnel before and after use	----	23
Follow IHOT protocols for disinfection of transport vehicle interior and exterior	----	23
Follow IHOT protocols for tempering of liberation water prior to release	----	23
Conduct fish contribution study	----	24
Develop approved genetics M&E plan	----	43
<b>Type 3</b> - Remedial actions requiring changes in monitoring coverage or interval		
Monitor DO and TGP and record	----	5b
Run analysis for water chemistry parameters, turbidity, alkalinity, hardness, nitrite, and contaminants	----	5c-5g

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

<b>Remedial Action Required</b>	<b>Cost</b>	<b>PMS<sup>1</sup></b>
<b>Type 4</b> - Remedial actions requiring significant capital expenditures		
Install security alarms	\$15,000	6
Construct a new 4'W x 6'H x 100' L outlet channel	\$150,000	13
<b>Type 5</b> - Remedial actions that may require significant capital expenditures but are not clearly definable at this time		
None	----	

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<sup>1</sup> 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 Leaburg Fish 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:  
Leaburg Fish Hatchery - Summer Steelhead**

Year	Fisheries <sup>1</sup> (Broodyear)	Spawning Grounds <sup>1</sup> (Broodyear)	Hatchery <sup>1</sup> (Broodyear)	Total Combined Contribution <sup>2</sup> (Broodyear)	Smolt to Adult Survival (percent)
1981					
1982					
1983					
1984					
1985					
1986					
1987					
1988					
1989					
1990	2,747	---	58	2,805	2.39
1991	1,044	---	74	1,118	1.03
1992	2,942	---	148	3,090	2.87

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

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

## Annual Operating Expenditures

The level and detail of annual operating expenditures varies widely depending on hatchery, operating agency, and funding source. When provided, expenditures were presented in terms of personnel costs, operating costs (power, feed, supplies), capital costs, indirect costs charged to the federal government, third-party costs, and other costs. These cost components were summed to determine a total hatchery annual cost. Based on discussion with the hatchery manager, the percent of total hatchery costs allocated to a given program was estimated. The total hatchery costs and the percent of hatchery costs allocated to a given program were used to compute the cost of a given program. Table 5 shows the annual operating expenses for the Leaburg Fish 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 (Tables 5a, 5b, and 5c).

**Table 5. Annual Operating Expenses: Leaburg Fish Hatchery - Summer Steelhead**

Hatchery	1993	1994	1995
1. Leaburg Hatchery	\$91,085	\$100,685	\$102,327
2. South Santiam Hatchery	\$175,694	\$164,666	\$198,865
3. Oak Springs	\$73,835	\$75,863	\$161,661
4.			
5.			
<b>Total Program Costs</b>	<b>\$340,614</b>	<b>\$341,214</b>	<b>\$462,853</b>

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

**Table 6. Annual Operating Expenses - Leaburg Fish Hatchery**

Program	1993	1994	1995
1. Summer Steelhead	\$91,085	\$100,685	\$102,327
2.			
3.			
4.			
5.			

<b>Total Hatchery Costs</b>	<b>\$91,085</b>	<b>\$100,685</b>	<b>\$102,327</b>
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**Table 5a. Annual Operating Expenses: Leaburg Fish Hatchery -  
Summer Steelhead**

**Expenditure Occurring at Leaburg Fish Hatchery**

<b>Component</b>	<b>1994</b>	<b>1995</b>	<b>1996</b>
Personnel Costs	\$301,487	\$320,819	\$376,912
Operational Costs	\$274,591	\$286,021	\$385,180
Capital Costs	\$11,930	\$25,426	\$91,109
Indirect Costs	\$106,771	\$110,086	\$140,268
Lumped Hatchery Costs <sup>1</sup>			
Lumped Third-Party Costs			
<b>Total Hatchery Costs</b>	<b>\$694,778</b>	<b>\$742,351</b>	<b>\$993,469</b>
<b>Source of Funds</b>			
Program Production (lb)	33,812	39,675	29,443
Total Production (lb)	257,812	284,659	285,938
Program as Percent of Total	13.01%	13.9%	10.3%
<b>Program Costs</b>	<b>\$91,085</b>	<b>\$100,685</b>	<b>\$102,327</b>

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

**Table 5b. Annual Operating Expenses: Leaburg Fish Hatchery -  
Summer Steelhead**

**Expenditure Occurring at South Santiam Hatchery**

<b>Component</b>	<b>1994</b>	<b>1995</b>	<b>1996</b>
Personnel Costs	\$172,561	\$166,730	\$188,001
Operational Costs	\$232,905	\$257,529	\$284,689
Capital Costs	\$10,776	\$2,888	\$3,525
Indirect Costs	\$65,810	58,044	\$69,797
Lumped Hatchery Costs <sup>1</sup>			
Lumped Third-Party Costs			
<b>Total Hatchery Costs</b>	<b>\$429,569</b>	<b>\$405,580</b>	<b>\$469,022</b>
<b>Source of Funds</b>			
COE	<b>30%</b>	<b>30%</b>	<b>30%</b>
ODFW	<b>70%</b>	<b>70%</b>	<b>70%</b>
Program Production (lb)	41,452	40,968	44,100
Total Production (lb)	101,452	100,968	104,100
Program as Percent of Total	40.6%	40.6%	40.6%
<b>Program Costs</b>	<b>\$175,694</b>	<b>\$164,666</b>	<b>\$198,865</b>

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

**Table 5c. Annual Operating Expenses: Leaburg Fish Hatchery -  
Summer Steelhead**

**Expenditure Occurring at Oak Springs**

<b>Component</b>	<b>1994</b>	<b>1995</b>	<b>1996</b>
Personnel Costs	\$219,923	\$219,923	\$220,865
Operational Costs	\$125,111	\$125,111	\$139,555
Capital Costs	\$0	\$0	\$360,420
Indirect Costs	\$60,654	\$60,654	\$75,521
Lumped Hatchery Costs <sup>1</sup>			
Lumped Third-Party Costs			
<b>Total Hatchery Costs</b>	<b>\$405,687</b>	<b>\$405,687</b>	<b>\$796,361</b>
<b>Source of Funds</b>			
ODFW	<b>100%</b>	<b>100%</b>	<b>100%</b>
Program Production (lb)	30,900	31,750	34,481
Total Production (lb)	170,000	170,000	170,000
Program as Percent of Total	18.2%	18.7%	20.3%
<b>Program Costs</b>	<b>\$73,835</b>	<b>\$75,863</b>	<b>\$161,661</b>

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

**Table 6a. Detailed Expenditures at Leaburg Fish Hatchery by Program**

**Summer Steelhead**

<b>Component</b>	<b>1994</b>	<b>1995</b>	<b>1996</b>
Personnel Costs	\$301,487	\$320,819	\$376,912
Operational Costs	\$274,591	\$286,021	\$385,180
Capital Costs	\$11,930	\$25,426	\$91,109
Indirect Costs	\$106,771	\$110,086	\$140,268
Lumped Hatchery Costs <sup>1</sup>			
Lumped Third-Party Costs			
<b>Total Hatchery Costs</b>	<b>\$694,778</b>	<b>\$742,351</b>	<b>\$993,469</b>
<b>Source of Funds</b>			
COE			
Program Production (lb)	33,812	39,675	29,443
Total Production (lb)	257,812	284,659	285,938
Program as Percent of Total	13.01%	13.9%	10.3%
<b>Program Costs</b>	<b>\$91,085</b>	<b>\$100,685</b>	<b>\$102,327</b>

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