
HATCHERY EVALUATION REPORT

Marion Forks Hatchery - Spring Chinook (Clackamas River Stock)

February 1997

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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Executive Summary

This report presents the findings of the independent audit of the Marion Forks Hatchery - Spring Chinook (Clackamas River Stock) program. The hatchery is located along Marion and Horn creeks (Santiam River tributaries in the Willamette Basin) about 17 miles east of Detroit, Oregon. Minto pond is operated as a satellite facility. The hatchery is used for adult collection, egg incubation, and rearing of spring chinook and 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.

Marion Forks Hatchery - Spring Chinook (Clackamas River Stock) Results

The Marion Forks facility includes one pond for adult holding, 8 concrete raceways, 48 circular rearing ponds, 12 Canadian troughs, and incubation facilities. The U.S. Army Corps of Engineers (COE) funds the majority of operation costs as mitigation for the development of Detroit and Big Cliff dams.

The Marion Forks Hatchery - Spring Chinook (Clackamas River Stock) program was in general compliance with most of the performance measures. In the area of program objectives, the hatchery needed to develop a eyed-egg to fry goal for the IHOT Operations Plan. The audit found that the hatchery was not in compliance with the water quality monitoring requirements, incubation and rearing temperature criteria, pathology-free water criteria, alarm requirements, feed preparation protocols, and release facilities, which are all facilities requirements. The hatchery needed to develop specific incubation and rearing standards for the IHOT Operations Plan. The hatchery was not meeting all the disinfection protocols for transportation equipment.

The specific areas in which the Marion Forks Hatchery - Spring Chinook (Clackamas River Stock) 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 IHOT QA/QC tests for feed preparation
- Develop alarm log
- Develop disease-free water supply for incubation and early rearing
- Develop eyed-egg to fry goals for IHOT Operational Plan
- Develop specific incubation and rearing standards for the IHOT Operations Plan
- Follow IHOT protocols for disinfection of transportation equipment and personnel before and after use
- Follow IHOT protocols for removal of pellets from freezer
- Follow IHOT requirements for disinfection of interiors and exteriors of transport vehicles
- Install alarms at intake, rearing ponds, and headboxes
- Install foot baths in the incubation facilities
- Install telephone pagers
- Provide effluent screen in effluent channel - rotating drum screen for 24 cfs
- Review IHOT temperature criteria for rearing
- Review need for rearing in the subbasin
- Run analysis for water quality parameters, turbidity, alkalinity, hardness, nitrite and contaminants

Non-compliance issues resulting from items beyond human control or Performance Measures not relevant to this hatchery (Type 1 in Table 3, Section 4 of this report) were not listed above.

Facility Description

Name:	Marion Forks Fish Hatchery
Stock/Species:	Spring Chinook (North Fork Santiam River Stock) Spring Chinook (Clackamas River Stock) Winter Steelhead Cutthroat Trout
Operating Agency:	Oregon Department of Fish & Wildlife
Funding Agency:	COE ODFW
Location:	The hatchery is located along Marion and Horn creeks (Santiam River tributaries in the Willamette Basin) about 17 miles east of Detroit, Oregon. Minto pond is operated as a satellite facility.
Address:	Star Route, Box 71 Idanha, OR 97350
Hatchery Manager:	Mr. Terry Jones
Phone:	(541) 854-3522
Fax:	(541) 854-3503
Purpose:	The U.S. Army Corps of Engineers (COE) funds the majority of operation costs as mitigation for the development of Detroit and Big Cliff dams. The COE mitigation agreement requires the annual production of no more than 84,000 pounds of juvenile chinook and steelhead to mitigate for hydroelectric development in the North Santiam River.
Production Goal:	Spring Chinook (North Fork Santiam River Stock) Produce 100,000 fry (500 lb) for release into Detroit Reservoir Produce 667,000 smolts (60,636 lb) for release in the North Santiam River

Spring Chinook (Clackamas River Stock)

Rear 580,000 fingerlings for transfer to South Santiam Hatchery

Rear 365,000 smolts (18,250 lb) for transfer back to Clackamas Hatchery

Winter Steelhead

Produce 100,000 smolts (20,000 lb) for release into the North Santiam River

Provide 25,500 eggs to Oregon's Salmon and Trout Enhancement Program

Cutthroat Trout

Rear 68,000 fingerlings (454 lb) for transfer to Fall River Hatchery

Water Supply:

There are two water rights: 15,257 gpm from Marion Creek and 14,368 gpm from Horn Creek. Water is supplied from Marion Creek from April through September, and from Horn Creek from October through March.

Facilities:

Adult Holding:	None; see Minto Ponds under satellite facilities
Incubation:	18 full stacks of vertical tray incubators (288 trays)
Early Rearing:	12 fiberglass Canadian troughs - 98 cf each
Raceways:	8 concrete raceways - 4,000 cf each
Rearing Ponds:	48 circular concrete ponds - 980 cf each
Satellite Facilities:	Minto Pond
	1 concrete adult holding and acclimation pond - 31,488 cf

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.

¹Integrated 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 Marion Forks Hatchery was conducted on February 6, 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 Marion Forks Hatchery - Spring Chinook (Clackamas River Stock)

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 Marion Forks Hatchery - Spring Chinook (Clackamas River Stock) 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 Marion Forks Hatchery - Spring Chinook (Clackamas River Stock)

Component	Location of Adult Holding, Spawning, Incubation, and Rearing					
	Clackamas Hatchery	Marion Forks Hatchery	South Santiam Hatchery			
Adult Collection	✓					
Adult Holding	✓					
Spawning	✓					
Fertilization						
Incubation						
green-to-eyed	✓					
eyed-to-hatch		✓				
Rearing						
fry		✓	580k @250/# shipped to South Santiam hatchery			
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 Clackamas River Plan	
the hatchery operating under a current hatchery operational plan?		✓			IHOT Operations Plan and Marion Forks Hatchery Operation and Maintenance Plan	
is it understood by staff?		✓				
is it being followed?		✓				
hatchery monitoring and evaluation plan in place?						
do you have a written monitoring and evaluation plan?		✓			CWT program and Missing Groups Reports	
Its contribution to fisheries, spawning grounds, and hatchery	✓				Reported at Clackamas Hatchery	
Its pre-spawning survival as compared with established	✓				Adult Holding at Clackamas Hatchery	
Its take as compared with established hatchery goal	✓				Spawning at Clackamas Hatchery	
Its ten-egg to eyed-egg survival as compared with established	✓				Incubation at Clackamas Hatchery	
Its eyed-egg to fry survival as compared with established goal			✓		No goal	Develop a eyed-egg to fry goal for the IHOT Operations Plan
Its smolt survival as compared with established goal		✓			Review of records; in compliance 3 out of last 3 years	
Its production as compared with established goal		✓			Review of records; in compliance 3 out of last 3 years	
Its percent survival (smolt to adult) as compared with established goal	✓				Reported at Clackamas Hatchery	
Its number of eggs, fry, fingerlings, smolts, and/or adults to meet statewide needs	✓				Review of records/Discussion	

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
Temperature						
Does your water temperature meet the criteria for spawning?	✓				No spawning on station	
Does your water temperature meet the criteria for incubation?				✓	Use cooler water to slow growth	None
Does your water temperature meet the criteria for rearing?				✓	Review of records/Discussion	Review IHOT temperature criteria for rearing
Dissolved gases						
Is the oxygen level near saturation?		✓			Review of records/Discussion	
Is the dissolved nitrogen level less than saturation?		✓			Review of records/Discussion	
Chemistry						
Ammonia (un-ionized)			✓		No recent 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
Turbidity						
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		
Alkalinity and hardness						
Does your alkalinity and hardness meet the criteria?			✓		No data	Run analysis
Nitrite						
Does your nitrite meet the criteria?			✓		Review of records/Discussion	Run analysis
Pesticide Contaminants						
Aldrin			✓		No data	Run analysis
Dieldrin			✓		See above	See above
Heptachlor			✓		See above	See above
Chlordane			✓		See above	See above
Methoxychlor			✓		See above	See above
Endosulfan			✓		See above	See above
Malathion			✓		See above	See above
Parathion			✓		See above	See above
Disease						
What portions of the hatchery have disease-free water?						
Adult holding	✓			✓	Adult holding at Clackamas Hatchery	Develop disease-free water supply for incubation and early rearing
Incubation					Inspection of facilities/Discussion	
Early rearing				✓	Inspection of facilities/Discussion	See above
Rearing				✓	Inspection of facilities/Discussion	None
Egg hardening		✓			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		
Alarm Systems						
Do the following areas have alarms?						
Intake				✓	Inspection of facilities/Discussion	Install alarms at intake, rearing ponds, and headboxes
Large rearing ponds and adult holding ponds				✓	Inspection of facilities/Discussion	See above
Raceway headboxes and rearing ponds				✓	Inspection of facilities/Discussion	See above
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 alarms
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	
Is there a log of alarms for emergencies, tests, and maintenance requirements?				✓	Review of records/Discussion	Develop alarm log
Are telephone pagers used?				✓	Discussion	Install telephone pages
Adult collection and holding facilities						
Do you meet the adult holding criteria?	✓				Adult holding at Clackamas Hatchery	

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
<p>habitation facilities</p> <p>type 1: <u>Vertical tray</u> do you have an adequate number of units for the overall program?</p> <p>type 2: _____ do you have an adequate number of units for the overall program?</p>		✓			Inspection of facilities/Discussion	
<p>ring facilities</p> <p>type 1: <u>Raceways</u> do you have an adequate number of units for the overall program?</p> <p>type 2: <u>Circular troughs</u> do you have an adequate number of units for the overall program?</p> <p>type 3: <u>Troughs</u> do you have an adequate number of units for the overall program?</p>	✓				Not used for this program Inspection of facilities/Discussion Not used for this program	
<p>screening facilities</p> <p>do you meet the approach velocity criteria?</p> <p>are the fish screens regularly cleaned?</p> <p>does the screen mesh meet screen opening criteria?</p> <p>are rearing containers double screened for fish that should not be released to adjacent water?</p>		✓			Inspection of facilities/Discussion Inspection of facilities/Discussion Inspection of facilities/Discussion	
<p>predation control facilities</p> <p>are your predation control facilities effective?</p>		✓		✓	Inspection of facilities/Discussion	Provide effluent screen in effluent channel - rotating drum screen for 24 cfs

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
Feed storage facilities and quality control						
Do 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.				✓	Removed one day prior for thawing	Follow IHOT protocols for removal of pellets from freezer
Do not leave buckets of feed or feed containers outside exposed to light or heat.		✓			Discussion	
Open bags of feed should be fed within 1 to 2 days except when feeding small groups of fish.		✓			Discussion	
Automatic feeder hoppers and bulk storage facilities should be insulated against excessive temperatures (80°F and above).	✓				No automatic feeders or bulk storage	

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

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
Broodstock selection practices						
Is the donor selection process document attached? (PM #40a)	✓				Existing program; does not apply	
Was the donor selection outline followed in selecting the hatchery broodstock? (PM #40b-c)	✓				Existing program; does not apply	
Spawning practices						
Were the appropriate number of spawners, male/female ratios, and fertilization protocols used? (PM #42c-g)	✓				Spawning occurs at Clackamas Hatchery	
Incubation practices						
Are specific incubation standards listed in the hatchery operations plan?		✓			Reviewed IHOT Operations Plan and Marion Forks Hatchery O&M Plan	Develop specific incubation standards for the IHOT Operations Plan
Are incubation practices written?		✓			See above	
Incubation Type 1: <u>Vertical tray</u> (see PM #8) Do you meet the loading and flow criteria?		✓			Review of records/Discussion	
Incubation Type 2: _____ (see PM #8) Do you meet the loading and flow criteria?	✓				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		
rearing practices						
specific rearing standards listed in the hatchery operations ?		✓			Reviewed IHOT Operations Plan and Marion Forks Hatchery O&M Plan	Develop specific rearing standards for the IHOT Operations Plan
rearing practices written?		✓			See above	
rearing Unit Type 1: <u>Raceways</u> (see PM #9)						
Do you meet the density and DI criteria?	✓				Not used for this program	
Do you meet the Loading and FI criteria?	✓				Not used for this program	
rearing Unit Type 2: <u>Circular ponds</u> (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	
rearing Unit Type 3: <u>Troughs</u> (see PM #9)						
Do you meet the density and DI criteria?	✓				Not used for this program	
Do you meet the Loading and FI criteria?	✓				Not used for this program	
Smolt quality						
Do you produce a high quality smolt?	✓				Released at Clackamas Hatchery	

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
health management practices						
Are the monthly hatchery monitoring visits being conducted? (PM #26)		✓			Review of records/Discussion	
Are the annual broodstock inspections being conducted? (PM #27)	✓				At Clackamas	
Is there pathogen-free water (PM #5h) and are the sanitation procedures being followed? (PM #28)				✓	Review of records/Discussion	See PM #5h and PM #28
Are the following water quality parameters within criteria? (PM #5a-5g)						
Water temperature				✓	Review of records/Discussion	See PM #5a
Dissolved gases		✓			Review of records/Discussion	See PM #5c
Chemistry			✓		Review of records/Discussion	See PM #5d
Turbidity			✓		Review of records/Discussion	See PM #5e
Alkalinity and hardness			✓		Review of records/Discussion	See PM #5f
Nitrite			✓		Review of records/Discussion	See PM #5g
Contaminants			✓		Review of records/Discussion	
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>Do hatchery performance meet requirements outlined in regional hatchery policies and in subbasin and hatchery policies for the following areas?</p> <p>Percent smoltification</p> <p>Do you measure percent smoltification? Do you have a smoltification goal? Did you meet the smoltification criteria?</p>	✓ ✓ ✓				Discussion Discussion Discussion	Released at Clackamas Hatchery See above See above
<p>Rearing density (prior to release)</p> <p>Did you meet the rearing density criteria just prior to release?</p>		✓			Review of records/Discussion	
<p>Release condition (at release)</p> <p>Did you meet all disease regulations just prior to release?</p>		✓			Review of records/Discussion	
<p>Release number (at release)</p> <p>Did you meet the release number goal?</p>		✓			Review of records/Discussion	
<p>Release size (at release)</p> <p>Did you meet the size goal?</p>		✓			Review of records/Discussion	
<p>Release date</p> <p>Did you meet the release date goal?</p>		✓			Review of records/Discussion	
<p>Release location</p> <p>Did you release the fish at the specified location?</p>	✓				Released at Clackamas Hatchery	
<p>Release location and acclimation</p> <p>Were the fish reared in the subbasin? Were the fish acclimated in the subbasin?</p>		✓		✓	Discussion Discussion	Review need for rearing in the subbasin
<p>Is the release strategy appropriate for the program?</p>	✓				Released at Clackamas Hatchery	

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
Transportation facilities						
Do transportation equipment and personnel receive disinfection before and after use?				✓	Discussion	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 as generation method (relative humidity of 60% for 2 hrs)?		✓			Discussion	
Is the exterior of the fish transport vehicle disinfected using high pressure steam (115-130°C), high temperature acid, or with 200 ppm chlorine for 30 minutes?				✓	Discussion	Follow IHOT requirements for disinfection of interiors and exteriors of transport vehicles
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?		✓			Discussion	
200 ppm chlorine for 30 minutes 600 ppm quaternary ammonia compound for 30 minutes 200 ppm iodophor solution for 10 minutes		✓			Discussion	
Do personnel wear protective garments when handling fish eggs or cultural water?		✓			Discussion	
Do the fish transport truck/chassis and tank/unit receive an inspection and service prior to the release season?		✓			Discussion	
Is a daily service inspection completed before starting up and leaving for the day?		✓			Discussion	

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

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

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
Training 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 conducted by a qualified fish health specialist as described below?						
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	
all of the functions of the hatchery yearly monitoring tasks being completed as described below?						
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>enibacterium 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>Is the hatchery following accepted sanitation procedures?</p> <p>Are there any sources of pathogen-free water, especially for incubation and early rearing?</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>✓</p> <p>✓</p> <p>✓</p> <p>✓</p> <p>✓</p> <p>✓</p>		<p>✓</p> <p>✓</p> <p>✓</p> <p>✓</p> <p>✓</p> <p>✓</p>	<p>Discussion</p> <p>Inspection of facilities/Discussion</p> <p>Inspection of facilities/Discussion</p> <p>Spawning at Clackamas Hatchery</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>Provide pathogen-free water for incubation and early rearing</p> <p>Install foot baths in the incubation facilities</p>

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
water quality parameters being followed?						
Are the following water quality parameters within criteria? (PM #5a-5g)						
Water temperature		✓		✓	Review of records/Discussion	See PM #5a
Dissolved gases		✓			Review of records/Discussion	
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
Go to PM #21						
incubation and rearing standards being followed?						
Are the incubation practices following the IHOT incubation criteria? (PM #18)		✓			Review of records/Discussion	
Are the rearing practices following the IHOT criteria? (PM #19)		✓			Review of records/Discussion	
Go to rearing practices PM #18-PM #19						
egg and fish transfer/release requirements met?		✓			Discussion	

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
<p>Is the hatchery's program outlined in a subbasin management plan?</p> <p>Refer to subbasin plan PM #1</p>		✓			Columbia Basin System Planning Production Plan and Clackamas River Subbasin Plan	
<p>Is the hatchery operating under a current hatchery operational plan?</p> <p>Refer to operational plan PM #2</p>		✓			Review IHOT Operations Plan and Marion Forks Hatchery O&M Plan	
<p>Is hatchery monitoring and evaluation plan in place?</p> <p>Refer to hatchery monitoring and evaluation plan PM #3</p>		✓			CWT and Missing Groups Report	

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
Does the hatchery program meet requirements established in regional hatchery policies and subbasin planning documents in the following areas: species, stock, broodstock collection location, broodstock numbers, broodstock collection strategy, and spawning and egg-take protocols?						
Does the hatchery program meet the requirements for the following?						
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)	✓				Broodstock collection and spawning at Clackamas 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		
Do the hatchery's performance meet requirements outlined in the regional hatchery policies and in subbasin and hatchery plans for the following areas: percent smoltification, rearing density, disease condition, and the number, size (s), and location of release?						
Percent smoltification (PM #22a1)	✓				Review of records/Discussion	Release at Clackamas Hatchery
Rearing density (PM #22a2)		✓			Review of records/Discussion	
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	
Are fish reared in the subbasin or acclimated in the subbasin?		✓			Discussion	
PM #22b						
Is the release strategy appropriate for the program?		✓			Discussion	
PM #22c						

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

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
<p>existing programs, were the broodstock collection procedures followed?</p> <p>Is the broodstock collection plan written? 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 collection at Clackamas 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		
<p>Is there a genetics monitoring and evaluation program in place?</p> <p>Is there a genetics monitoring and evaluation program available?</p> <p>Does the plan address the following elements listed in IHOT:</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>Adults return to Clackamas Hatchery</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 Marion Forks Hatchery - Spring Chinook (Clackamas River Stock)

This section presents the corrective actions required to bring the Marion Forks Hatchery - Spring Chinook (Clackamas River Stock) 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 Marion Forks Hatchery - Spring Chinook (Clackamas River Stock)

Remedial Action Required	Cost	PMS¹
<p>Type 1 - Non-compliance issues resulting from items beyond human control or Performance Measures not relevant for this hatchery</p> <p>None</p>		
<p>Type 2 - Remedial actions requiring changes in agency policies or procedures</p> <p>Develop eyed-egg to fry goals for IHOT Operational Plan</p> <p>Review IHOT temperature criteria for rearing</p> <p>Install security alarms</p> <p>Develop alarm log</p> <p>Conduct IHOT QA/QC tests for feed preparation</p> <p>Follow IHOT protocols for removal of pellets from freezer</p> <p>Develop specific incubation and rearing standards for the IHOT Operations Plan</p> <p>Reveiw need for rearing in the subbasin.</p> <p>Follow IHOT protocols for disinfection of transportation equipment and personnel before and after use</p> <p>Follow IHOT requirements for disinfection of interiors and exteriors of transport vehicles</p> <p>Install foot baths in the incubation facilities</p>	<p>----</p>	<p>4e</p> <p>5a</p> <p>6</p> <p>6</p> <p>12</p> <p>12</p> <p>18-19</p> <p>22b</p> <p>23</p> <p>23</p> <p>28</p>
<p>Type 3 - Remedial actions requiring changes in monitoring coverage or interval</p> <p>Run analysis for water quality parameters, turbidity, alkalinity, hardness, nitrite and contaminants</p>	<p>----</p>	<p>5c-5g</p>

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	PMS¹
Type 4 - Remedial actions requiring significant capital expenditures		
Install alarms at intake, rearing ponds, and headboxes	\$30,000	6
Install telephone pagers	\$5,000	6
Provide effluent screen in effluent channel - rotating drum screen for 24 cfs	\$120,00	10
Type 5 - Remedial actions that may require significant capital expenditures but are not clearly definable at this time		
Develop disease-free water supply for incubation and early rearing	----	5h, 28

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

Hatchery Contribution to Fisheries, Spawning Grounds, and Hatcheries

This section presents the audit findings for the Marion Forks Hatchery - Spring Chinook (Clackamas River Stock) 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:
Marion Forks Hatchery - Spring Chinook (Clackamas River Stock)**

Year	Fisheries ¹ (Broodyear)	Spawning Grounds ¹ (Broodyear)	Hatchery ¹ (Broodyear)	Total Combined Contribution ² (Broodyear)	Smolt to Adult Survival (percent)
1984					
1985					
1986					
1987	Reported at Clackamas Hatchery	Reported at Clackamas Hatchery	Reported at Clackamas Hatchery	Reported at Clackamas Hatchery	Reported at Clackamas Hatchery
1988	Reported at Clackamas Hatchery	Reported at Clackamas Hatchery	Reported at Clackamas Hatchery	Reported at Clackamas Hatchery	Reported at Clackamas Hatchery
1989	Reported at Clackamas Hatchery	Reported at Clackamas Hatchery	Reported at Clackamas Hatchery	Reported at Clackamas Hatchery	Reported at Clackamas Hatchery
1990	Reported at Clackamas Hatchery	Reported at Clackamas Hatchery	Reported at Clackamas Hatchery	Reported at Clackamas Hatchery	Reported at Clackamas Hatchery
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.

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 Marion Forks Hatchery - Spring Chinook (Clackamas River Stock) program. For programs that occur at more than one facility (as shown on Table 1 in Section 3 of this report), the cost breakdown for the component(s) at each facility is presented in separate tables (Table 5a).

Table 5. Annual Operating Expenses: Marion Forks Hatchery - Spring Chinook (Clackamas River Stock)

Hatchery	1994	1995	1996
1. Spring Chinook (Clackamas River Stock) ^(A)	\$0	\$0	\$0
2.			
3.			
4.			
Total Program Costs	Reported at Clackamas Hatchery	Reported at Clackamas Hatchery	Reported at Clackamas Hatchery

(A) No costs charged to Marion Forks Hatchery.

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

Table 6. Annual Operating Expenses - Marion Forks Hatchery

Program	1994	1995	1996
1. Spring Chinook (N.F. Santiam River Stock)	\$387,351	\$431,425	\$355,594
2. Spring Chinook (Clackamas River Stock)	\$0	\$0	\$0
3. Winter Steelhead	\$55,335	\$9,705	\$79,649
4.			
Total Hatchery Costs	\$442,686	\$441,130	\$435,243

**Table 5a. Annual Operating Expenses: Marion Forks Hatchery -
Spring Chinook (Clackamas River Stock)**

Expenditure Occurring at Marion Forks Hatchery

Component	1994	1995	1996
Personnel Costs	\$196,088	\$200,303	\$191,936
Operational Costs	\$134,888	\$173,728	\$159,662
Capital Costs	\$49,451	\$3,000	\$17,000
Indirect Costs	\$62,259	\$64,099	\$66,645
Lumped Hatchery Costs ¹			
Lumped Third-Party Costs			
Total Hatchery Costs	\$442,686	\$441,130	\$435,243
Source of Funds			
COE	83.75%	83.75%	83.75%
ODFW	16.25%	16.25%	16.25%
Program Production (#)			
Total Production (#)			
Program as Percent of Total	0%	0%	0%
Program Costs	\$0	\$0	\$0

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 Marion Forks Hatchery by Program
Spring Chinook (North Fork Santiam River Stock)**

Component	1994	1995	1996
Personnel Costs	\$196,088	\$200,303	\$191,936
Operational Costs	\$134,888	\$173,728	\$159,662
Capital Costs	\$49,451	\$3,000	\$17,000
Indirect Costs	\$62,259	\$64,099	\$66,645
Lumped Hatchery Costs ¹			
Lumped Third-Party Costs			
Total Hatchery Costs	\$442,686	\$441,130	\$435,243
Source of Funds			
COE	83.75%	83.75%	83.75%
ODFW	16.25%	16.25%	16.25%
Program Production (#)	884,820	739,757	670,000
Total Production (#)	1,010,319	756,000	820,000
Program as Percent of Total	87.5%	97.8%	81.7%
Program Costs	\$387,351	\$431,425	\$355,594

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 Marion Forks Hatchery by Program
Spring Chinook (Clackamas River Stock) ^(a)

Component	1994	1995	1996
Personnel Costs	\$196,088	\$200,303	\$191,936
Operational Costs	\$134,888	\$173,728	\$159,662
Capital Costs	\$49,451	\$3,000	\$17,000
Indirect Costs	\$62,259	\$64,099	\$66,645
Lumped Hatchery Costs ¹			
Lumped Third-Party Costs			
Total Hatchery Costs	\$442,686	\$441,130	\$435,243
Source of Funds			
COE	83.75%	83.75%	83.75%
ODFW	16.25%	16.25%	16.25%
Program Production (#)			
Total Production (#)			
Program as Percent of Total	0%	0%	0%
Program Costs	\$0	\$0	\$0

(a) Cost for this program not charged to Marion Forks.

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 6c. Detailed Expenditures at Marion Forks Hatchery by Program

Winter Steelhead

Component	1994	1995	1996
Personnel Costs	\$196,088	\$200,303	\$191,936
Operational Costs	\$134,888	\$173,728	\$159,662
Capital Costs	\$49,451	\$3,000	\$17,000
Indirect Costs	\$62,259	\$64,099	\$66,645
Lumped Hatchery Costs ¹			
Lumped Third-Party Costs			
Total Hatchery Costs	\$442,686	\$441,130	\$435,243
Source of Funds			
COE	83.75%	83.75%	83.75%
ODFW	16.25%	16.25%	16.25%
Program Production (#)	125,499	17,118	138,801
Total Production (#)	1,010,319	756,000	820,000
Program as Percent of Total	12.5%	2.2%	18.3%
Program Costs	\$55,335	\$9,705	\$79,649

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