

HATCHERY EVALUATION REPORT

Big Creek Hatchery - Fall Chinook (Big Creek Stock)

March 1997

Integrated Hatchery Operations Team (IHOT)

HATCHERY EVALUATION REPORT

Big Creek Hatchery - Fall Chinook (Big Creek Stock)

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 Big Creek Hatchery - Fall Chinook (Big Creek Stock) program. The hatchery is located 16 miles east of Astoria and is approximately 3 miles upstream from Big Creek's confluence with the Columbia River. The hatchery is used for adult collection, egg incubation, and rearing of winter steelhead, fall chinook, coho, and sea-run cutthroat.

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.

Big Creek Hatchery - Fall Chinook (Big Creek Stock) Results

The Big Creek facility includes 2 ponds for adult holding, 30 concrete raceways, 1 rearing pond, 2 Canadian troughs, and incubation facilities. Big Creek Hatchery began operation in 1941 as a

state-funded facility. It was refurbished in 1957 under the Mitchell Act as part of the Columbia River Fisheries Development Program - a program to enhance declining fish runs in the Columbia River Basin. The purpose of the hatchery is to produce adult salmon and cutthroat trout that will contribute to NE Pacific and Columbia River Basin commercial and sports fisheries.

The Big Creek Hatchery - Fall Chinook (Big Creek Stock) program was in general compliance with most of the performance measures. In the area of program objectives, the hatchery did not have a survival goal for green-egg to eyed-egg, eyed-egg to fry, and smolt to adult and was not meeting its adult return goal. The audit found that the hatchery was not in compliance with adult holding facilities, water quality monitoring requirements, alarm criteria, and pathology-free water criteria, which are all facilities requirements. The hatchery was not meeting the flow criteria for incubation. The hatchery needed to develop written incubation and rearing standards for the IHOT Operations Plan and develop a smoltification goal and monitoring plan. In the compliance area for fish health policy, the hatchery was not using foot baths in incubation and was not meeting all the sanitation protocols. The hatchery did not have a written broodstock collection plan, spawning protocols, or a Genetics Monitoring and Evaluation Program.

The specific areas in which the Big Creek Hatchery - Fall Chinook (Big Creek 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 test for feed preparation
- Develop alarm log
- Develop an additional 300 gpm of disease-free water for incubation

- Develop approved genetics M&E plan
- Develop smoltification goal and monitor
- Develop survival goal for green-egg to eyed-egg, eyed-egg to fry, and smolt to adult
- Develop written broodstock collection plan
- Develop written spawning protocols
- Develop written standards for incubation and rearing for the IHOT Operations Plan
- Follow IHOT procedures for checking other alarms weekly
- Follow IHOT protocols for not exposing feed or feed containers to light or heat
- Follow IHOT protocols for sanitation of equipment and rain gear utilized in broodstock handling or spawning prior to its use elsewhere in the hatchery
- Follow IHOT protocols for sanitation of rearing vessels after fish are removed and prior to introducing a new fish lot or stock
- Install intake alarm on Big Creek
- Install alarms on large rearing pond and adult holding ponds
- Install alarms on rearing ponds
- Install foot baths
- Monitor DO and TGP and record
- Rebuild adult holding and spawning facility
- Review IHOT flow criteria for the deep trough and vertical stack incubators
- Review need for new fingerling release channel
- Run analysis for water chemistry parameters, turbidity, alkalinity, hardness, 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: Big Creek Hatchery

Stock/Species: Fall Chinook (Big Creek Stock)

Fall Chinook (Big Creek/Rogue Stock)

Coho

Winter Steelhead

Sea-run Cutthroat

Operating Agency: Oregon Department of Fish and Wildlife

Funding Agency: Mitchell Act

Location: The hatchery is located 16 miles east of Astoria and is approximately 3 miles upstream from Big Creek's confluence with the Columbia River.

Address: Route 4, Box 594

Astoria, OR 97103

Hatchery Manager: Mr. David Rieben

Phone: (503) 458-6512

Fax: (503) 458-6529

Purpose: Big Creek Hatchery began operation in 1941 as a state-funded facility. It was refurbished in 1957 under the Mitchell Act as part of the Columbia River Fisheries Development Program - a program to enhance declining fish runs in the Columbia River Basin. The purpose of the hatchery is to produce adult salmon and cutthroat trout that will contribute to NE Pacific and Columbia River Basin commercial and

sports fisheries.

Production Goal:

Fall Chinook (Big Creek Stock)

Produce 5,700,000 smolts (71,250 lb) and 5,200,000 fingerlings (38,670 lb) for on-station release.

Provide 6,810,000 eggs for ODFW programs.

Fall Chinook (Big Creek/Rogue Stock)

Produce 1,000,000 smolts (67,778 lb) for on-station release.

Coho

Produce 535,000 smolts (48,636 lb) for on-station release.

Produce 60,000 smolts (4,000 lb) for release into the Tualatin River.

Winter Steelhead

Produce 60,000 smolts (12,000 lb) for on-station release.

Produce 63,000 smolts (6,300 lb) for transfer to Klaskanine Hatchery.

Provide 557,300 eggs for ODFW programs.

Sea-run Cutthroat

Produce smolts when adults are available.

Water Supply:

There are four water sources for the hatchery: Big Creek, Mill Creek, and two springs. Current water rights total 36,158 gpm plus an additional 4.2 cfs reservoir water right.

Facilities:

Adult Holding:	2 concrete adult holding ponds, 6,513 and 15,880 cf
Incubation:	4 16-tray vertical incubators
	48 shallow troughs - 13 cf each
	16 shallow troughs - 26 cf each
Early Rearing:	2 Canadian troughs - 108 cf
Raceways:	9 concrete raceways - 4400 cf each
	21 concrete raceways - 4400 cf each
Rearing Ponds:	1 concrete rearing pond - 12,112 cf
Satellite Facilities:	None

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

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

The Hatchery Audit Process

The hatchery audit will be conducted over a 2-year period that concludes in 1997. At each hatchery, a five-step process was used to complete the overall hatchery audit.

This process consisted of research and onsite visits. The site visit at the Big Creek Hatchery was conducted on March 18, 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 Big Creek Hatchery - Fall Chinook (Big Creek 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 Big Creek Hatchery - Fall Chinook (Big Creek 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 Big Creek Hatchery - Fall Chinook (Big Creek Stock)

Component	Location of Adult Holding, Spawning, Incubation, and Rearing					
	Big Creek Hatchery					
Adult Collection	4					
Adult Holding	4					
Spawning	4					
Fertilization	4					
Incubation						
green-to-eyed	4					
eyed-to-hatch	4					
Rearing						
fry	4					
fingerlings	4					
smolts	4					
Acclimation/release	4					

Table 2 Big Creek Hatchery - Fall Chinook (Big Creek Stock) Compliance With Performance Measures

PM #	Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
		N/A	Yes	?	No		
#1	Are the hatchery programs outlined in a subbasin management plan?		4			Columbia Basin System Planning Production Plan	
#2	Is the hatchery operating under a current hatchery operational plan? Is it understood by staff? Is it being followed?		4 4 4			IHOT Operations Plan	
#3	Is a hatchery monitoring and evaluation plan in place? Do you have a written monitoring and evaluation plan?		4			CWT and Missing Production Reports	
#4a	Adult contribution to fisheries, spawning grounds, and hatchery		4			Review of records	
#4b	Adult pre-spawning survival as compared with established goal				4	Review of records; in compliance 2 out of last 3 years	Rebuild spawning facility
#4c	Egg-take as compared with established hatchery goal				4	Review of records; in compliance 2 out of last 3 years	Improve adult returns

Table 2 Big Creek Hatchery - Fall Chinook (Big Creek Stock) Compliance With Performance Measures

		N/A	Yes	?	No		
#4d	Green-egg to eyed-egg survival as compared with established goal			4		No goal	Develop green-egg to eyed-egg survival goal for IHOT Operations Plan
#4e	Eyed-egg to fry survival as compared with established goal			4		No goal	Develop eyed-egg to fry survival goal for IHOT Operations Plan
#4f	Fry to smolt survival as compared with established goal		4			Review of records; in compliance 3 out of last 3 years	
#4g	Production as compared with established goal				4	Review of records; in compliance 2 out of last 3 years	Improve adult returns
#4h	Percent survival (smolt to adult) as compared with established goal			4		No goal	Develop smolt-to-adult goal for IHOT Operations Plan
#4i	Number of eggs, fry, fingerlings, smolts, and/or adults to meet basinwide needs	4				Review of records/Discussion	

Table 2 Big Creek Hatchery - Fall Chinook (Big Creek Stock) Compliance With Performance Measures

PM #	Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
		N/A	Yes	?	No		
#5a	Temperature						
	Does your water temperature meet the criteria for spawning?		4			Review of records/Discussion	
	Does your water temperature meet the criteria for incubation?		4			Review of records/Discussion	
	Does your water temperature meet the criteria for rearing?		4			Review of records/Discussion	
#5b	Dissolved gases						
	Is the oxygen level near saturation?			4		No data	Monitor DO and record
	Is the dissolved nitrogen level less than saturation?			4		No data	Monitor TGP and record
#5c	Chemistry						
	Ammonia (un-ionized)			4		No recent data	Run analysis
	Carbon Dioxide			4		See above	See above
	Chlorine			4		See above	See above
	pH			4		See above	See above
	Copper			4		See above	See above
	Hydrogen Sulfide			4		See above	See above
	Iron			4		See above	See above
Zinc			4		See above	See above	

Table 2 Big Creek Hatchery - Fall Chinook (Big Creek Stock) Compliance With Performance Measures

		N/A	Yes	?	No		
#5d	Turbidity						
	Does your turbidity meet the criteria?			4		No data	Run analysis

Table 2 Big Creek Hatchery - Fall Chinook (Big Creek Stock) Compliance With Performance Measures

PM #	Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
		N/A	Yes	?	No		
#5e	Alkalinity and hardness Does your alkalinity and hardness meet the criteria?			4		No data	Run analysis
#5f	Nitrite Does your nitrite meet the criteria?			4		No data	Run analysis
#5g	Contaminants Aldrin Endrin Dieldrin Heptachlor Chlordane Methoxychlor Lindane Malathion Guthion			4 4 4 4 4 4 4 4 4		No data See above See above See above See above See above See above See above See above	Run analysis See above See above See above See above See above See above See above See above
#5h	Pathogens What portions of the hatchery have disease-free water? Adult holding Incubation					4 4 Inspection of facilities/Discussion Limited spring water supply	None Develop an additional 300 gpm of spring water for incubation

Table 2 Big Creek Hatchery - Fall Chinook (Big Creek Stock) Compliance With Performance Measures

		N/A	Yes	?	No		
	Early rearing				4	Inspection of facilities/Discussion	
	Rearing				4	Inspection of facilities/Discussion	None
	Others				4	Inspection of facilities/Discussion	None

Table 2 Big Creek Hatchery - Fall Chinook (Big Creek Stock) Compliance With Performance Measures

PM #	Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
		N/A	Yes	?	No		
#6	Alarm Systems						
	Do the following areas have alarms?						
	Intake				4	Inspection of facilities/Discussion	Install intake alarm on Big Creek
	Large rearing ponds and adult holding ponds				4	Inspection of facilities/Discussion	Install alarms on large rearing ponds and adult holding ponds
	Raceway headboxes and rearing ponds				4	Inspection of facilities/Discussion	Install alarms on rearing ponds
	Incubation facilities		4			Inspection of facilities/Discussion	
	Quarantine areas and facilities	4				No quarantine areas and facilities	
	Water treatment systems	4				No water treatment systems	
	Security				4	Inspection of facilities/Discussion	Install security alarms
	Are there outside systems and buzzers in onsite residences?		4			Discussion	
	Are water flow alarms checked daily?		4			Review of records/Discussion	
	Are all other alarms checked weekly?				4	Discussion	Check other alarms weekly
	Is there a log of alarms for emergencies, tests, and maintenance requirements?				4	Review of records/Discussion	Develop alarm log
	Are telephone pagers used?		4			Discussion	

Table 2 Big Creek Hatchery - Fall Chinook (Big Creek Stock) Compliance With Performance Measures

		N/A	Yes	?	No		
#7	Adult collection and holding facilities						
	Do you meet the adult holding criteria?				4	Review of records/Discussion	Rebuild adult holding facility

Table 2 Big Creek Hatchery - Fall Chinook (Big Creek Stock) Compliance With Performance Measures

PM #	Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
		N/A	Yes	?	No		
#8	<p>Incubation facilities</p> <p>Type 1: <u>Shallow troughs</u> Do you have an adequate number of units for the overall program?</p> <p>Type 2: <u>Deep troughs</u> Do you have an adequate number of units for the overall program?</p> <p>Type 3: <u>Vertical stack</u> Do you have an adequate number of units for the overall program?</p>		4			<p>Inspection of facilities/Discussion</p> <p>Inspection of facilities/Discussion</p> <p>Inspection of facilities/Discussion</p>	
#9	<p>Rearing facilities</p> <p>Type 1: <u>Concrete raceways (20x80)</u> Do you have an adequate number of units for the overall program?</p> <p>Type 2: <u>Concrete raceways (10x160)</u> Do you have an adequate number of units for the overall program?</p>		4			<p>Inspection of facilities/Discussion</p> <p>Inspection of facilities/Discussion</p>	

Table 2 Big Creek Hatchery - Fall Chinook (Big Creek Stock) Compliance With Performance Measures

		N/A	Yes	?	No		
Type 3: <u>Pond</u>			4			Inspection of facilities/Discussion	
Do you have an adequate number of units for the overall program?							
Type 4: <u>Canadian troughs</u>			4			Inspection of facilities/Discussion	
Do you have an adequate number of units for the overall program?							

Table 2 Big Creek Hatchery - Fall Chinook (Big Creek Stock) Compliance With Performance Measures

PM #	Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
		N/A	Yes	?	No		
#10	Screening facilities						
	Do you meet the approach velocity criteria?		4			Inspection of facilities/Discussion	
	Are the fish screens regularly cleaned?		4			Inspection of facilities/Discussion	
	Does the screen mesh meet screen opening criteria?		4			Inspection of facilities/Discussion	
	Are rearing containers double screened for fish that should not be released to adjacent water?	4				Released on station	
#11	Predator control facilities						
	Are your predation control facilities effective?		4			Inspection of facilities/Discussion	

Table 2 Big Creek Hatchery - Fall Chinook (Big Creek Stock) Compliance With Performance Measures

PM #	Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
		N/A	Yes	?	No		
#12	<p>Food storage facilities and quality control</p> <p>Does the storage of dry/semi-moist/moist foods (dry<12%; semi-moist 12-20%; moist >20% moisture) follow food manufacturer's recommendations?</p> <p>Does a regional quality control officer oversee production procedures and monitor:</p> <p>Verification by feed manufacturer that ingredients meet specifications?</p> <p>Ensure feed does not contain unwanted drugs or other additives?</p> <p>Analyze ingredients contained in the final food product to ensure that feed specifications have been met?</p> <p>Are the foods stored and handled according to the following criteria?</p>		4			<p>Inspection of facilities/Discussion</p> <p>Discussion</p> <p>Discussion</p> <p>Discussion</p>	<p>Conduct IHOT QA/QC tests for feed preparation</p> <p>See above</p> <p>See above</p>

Table 2 Big Creek Hatchery - Fall Chinook (Big Creek Stock) Compliance With Performance Measures

		N/A	Yes	?	No		
	Moist pellets should not exceed 10°F at point of delivery.		4			Discussion	
	Moist pellets should be removed from freezer just prior to feeding.		4			Discussion	
	Do not leave buckets of feed or feed containers outside exposed to light or heat.				4	Discussion	Follow IHOT protocols for not exposing feed or feed containers to light or heat
	Open bags of feed should be fed within 1 to 2 days except when feeding small groups of fish.		4			Discussion	
	Automatic feeder hoppers and bulk storage facilities should be insulated against excessive temperatures (80°F and above).	4				No automatic feeders	

Table 2 Big Creek Hatchery - Fall Chinook (Big Creek Stock) Compliance With Performance Measures

PM #	Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
		N/A	Yes	?	No		
#13	Release facilities Do the release facilities ensure that fish are not subjected to adverse conditions?			4		Inspection of facilities/Discussion	Review need for new fingerling release channel
#14	Pollution abatement facilities Do the pollution abatement facilities meet all federal and state regulations (or good engineering practice)? Are pollution abatement facilities operated correctly?		4			Inspection of facilities/Discussion Discussion	
#15	Transportation facilities Are the transport systems adequate to meet IHOT performance measures for transportation practices?	4				Release on station	

Table 2 Big Creek Hatchery - Fall Chinook (Big Creek Stock) Compliance With Performance Measures

PM #	Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
		N/A	Yes	?	No		
#16	Broodstock selection practices						
	Is the donor selection process document attached? (PM #40a)	4				Existing program; does not apply	
	Was the donor selection outline followed in selecting the hatchery broodstock? (PM #40b-c)	4				Existing program; does not apply	
#17	Spawning practices						
	Were the appropriate number of spawners, male/female ratios, and fertilization protocols used? (PM #42c-g)				4	Review of records/Discussion	See PM #42
#18	Incubation practices						
	Are specific incubation standards listed in the hatchery operations plan?				4	Reviewed IHOT Operations Plan	Develop written incubation standards for the IHOT Operations Plan
	Are incubation practices written?				4	See above	See above
	Incubation Type 1: <u>Shallow trough</u> (see PM #8)		4			Review of records/Discussion	
	Do you meet the loading and flow criteria?						

Table 2 Big Creek Hatchery - Fall Chinook (Big Creek Stock) Compliance With Performance Measures

		N/A	Yes	?	No		
Incubation Type 2: <u>Deep trough</u> (see PM #8) Do you meet the loading and flow criteria?					4	Review of records/Discussion	Review IHOT flow criteria for deep troughs
Incubation Type 3: <u>Vertical stack</u> (see PM #8) Do you meet the loading and flow criteria?					4	Review of records/Discussion	Review IHOT flow criteria for vertical stack incubators

Table 2 Big Creek Hatchery - Fall Chinook (Big Creek Stock) Compliance With Performance Measures

PM #	Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
		N/A	Yes	?	No		
#19	Rearing practices						
	Are specific rearing standards listed in the hatchery operations plan?				4	Review IHOT Hatchery Operations Plan	Develop written rearing standards for the IHOT Operations Plan
	Are rearing practices written?				4	Review Hatchery Operations Plan	
	Rearing Unit Type 1: <u>Concrete raceways (20x80)</u> (see PM #9)						
	Do you meet the density and DI criteria?		4			Review of records/Discussion	
	Do you meet the Loading and FI criteria?		4			Review of records/Discussion	
	Rearing Unit Type 2: <u>Concrete raceways (10x160)</u> (see PM #9)						
	Do you meet the density and DI criteria?	4				Not used	
	Do you meet the Loading and FI criteria?	4				See above	
	Rearing Unit Type 3: <u>Pond</u> (see PM #9)						
	Do you meet the density and DI criteria?	4				Not used	
	Do you meet the Loading and FI criteria?	4				See above	
	Rearing Unit Type 4: <u>Canadian troughs</u> (see PM #9)						
	Do you meet the density and DI criteria?	4				Not used	
	Do you meet the Loading and FI criteria?	4				See above	

Table 2 Big Creek Hatchery - Fall Chinook (Big Creek Stock) Compliance With Performance Measures

		N/A	Yes	?	No		
#20	Smolt quality						
	Do you produce a high quality smolt?		4			Discussion	

Table 2 Big Creek Hatchery - Fall Chinook (Big Creek Stock) Compliance With Performance Measures

PM #	Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
		N/A	Yes	?	No		
#21	Fish health management practices						
	Are the monthly hatchery monitoring visits being conducted? (PM #26)		4			Review of records/Discussion	
	Are the annual broodstock inspections being conducted? (PM #27)		4			Review of records/Discussion	
	Is there pathogen-free water (PM #5h)and are the sanitation procedures being followed? (PM #28)				4	Review of records/Discussion	See PMs #5h and #28
	Are the following water quality parameters within criteria? (PM #5a-5g)						
	Water temperature		4			Review of records/Discussion	
	Dissolved gases			4		Review of records/Discussion	See PM 5b
	Chemistry			4		Review of records/Discussion	See PM 5c
	Turbidity			4		Review of records/Discussion	See PM 5d
	Alkalinity and hardness			4		Review of records/Discussion	See PM 5e
Nitrite			4		Review of records/Discussion	See PM 5f	
Contaminants			4		Review of records/Discussion	See PM 5g	
Are rearing standards being followed? (PM #19)		4			Review of records/Discussion		

Table 2 Big Creek Hatchery - Fall Chinook (Big Creek Stock) Compliance With Performance Measures

		N/A	Yes	?	No		
	Are egg and fish transfer/release requirements met? (PM #31)		4			Review of records/Discussion	

Table 2 Big Creek Hatchery - Fall Chinook (Big Creek Stock) Compliance With Performance Measures

PM #	Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
		N/A	Yes	?	No		
#22a	Does hatchery performance meet requirements outlined in the regional hatchery policies and in subbasin and hatchery plans for the following areas?						
#22a1	Percent smoltification Do you measure percent smoltification? Do you have a smoltification goal Did you meet the smoltification criteria?			4	4	Discussion Discussion Discussion	Develop smoltification goal and monitor See above See above
#22a2	Rearing density (prior to release) Did you meet the rearing density criteria just prior to release?		4			Review of records/Discussion	
#22a3	Disease condition (at release) Did you meet all disease regulations just prior to release?		4			Review of records/Discussion	
#22a4	Number (at release) Did you meet the release number goal?				4	In compliance 2 out of the last 3 years. Review of records/Discussion	See PM #4g
#22a5	Size at release Did you meet the size goal?		4			Review of records/Discussion	

Table 2 Big Creek Hatchery - Fall Chinook (Big Creek Stock) Compliance With Performance Measures

		N/A	Yes	?	No		
#22a6	Dates of release Did you meet the release date goal?		4			Review of records/Discussion	
#22a7	Location of release Did you release the fish at the specified location?		4			Review of records/Discussion	
#22b	Are fish reared in the subbasin or acclimated in the subbasin? Are the fish reared in the subbasin? Are the fish acclimated in the subbasin?		4 4			Discussion Discussion	
#22c	Is the release strategy appropriate for the program?		4			Discussion	

Table 2 Big Creek Hatchery - Fall Chinook (Big Creek Stock) Compliance With Performance Measures

PM #	Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
		N/A	Yes	?	No		
#23	Transportation facilities						
	Do transportation equipment and personnel receive disinfection before and after use?	4				Released on station	
	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)?	4				See above	
	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?	4				See above	
	Is the fish transport vehicle (cab) disinfected using 600 ppm quaternary ammonia compounds (1.5 ml of 50% stock solution/liter water)?	4				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?	4				See above	

Table 2 Big Creek Hatchery - Fall Chinook (Big Creek Stock) Compliance With Performance Measures

	N/A	Yes	?	No		
200 ppm chlorine for 30 minutes 600 ppm quaternary ammonia compound for 30 minutes 200 ppm iodophor solution for 10 minutes						
Do personnel wear protective garments when handling fish eggs or cultural water?	4				See above	
Do the fish transport truck/chassis and tank/unit receive an inspection and service prior to the release season?	4				See above	
Is a daily service inspection completed before starting up and leaving for the day?	4				See above	

Table 2 Big Creek Hatchery - Fall Chinook (Big Creek Stock) Compliance With Performance Measures

PM #	Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
		N/A	Yes	?	No		
#23 (cont)	Transportation facilities						
	Does the fish transport unit receive an inspection prior to loading?	4				Release on station	
	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?	4				See above	
	Do hauling criteria include checking the fish 45 minutes to 1 hour after loading?	4				See above	
	When fish are active and systems are functioning properly, is the oxygen concentration reduced and maintained at approximately 8 ppm?	4				See above	
	Is water temperature in the transportation unit maintained within the 42-48 °F range?	4				See above	

Table 2 Big Creek Hatchery - Fall Chinook (Big Creek Stock) Compliance With Performance Measures

	N/A	Yes	?	No		
Do fish releasing procedures include the following criteria?						
Releasing the fish at the correct release site or into the correct water body.	4				See above	
Tempering or the difference between the liberation tank and the target water body should not exceed 10°F.	4				See above	
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.	4				See above	

Table 2 Big Creek Hatchery - Fall Chinook (Big Creek Stock) Compliance With Performance Measures

PM #	Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
		N/A	Yes	?	No		
#24	<p>Evaluation practices</p> <p>Has the hatchery conducted fishery contribution studies to:</p> <p>Determine the requirements for evaluating and improving management programs?</p> <p>Develop guidelines that define the geographical area and identify component stocks (hatchery and/or wild) that comprise the management unit?</p> <p>Develop guidelines that define if the proper stocks of fish are currently being used?</p> <p>Determine which management units contribute to a specific fishery and the time periods of those contributions?</p> <p>Determine the relative contributions of the various management units to a specific fishery over the different time periods?</p>		4			Discussion	
			4			Discussion	
			4			Discussion	
			4			Discussion	
			4			Discussion	

Table 2 Big Creek Hatchery - Fall Chinook (Big Creek Stock) Compliance With Performance Measures

PM #	Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
		N/A	Yes	?	No		
#25	Training practices						
	Does the hatchery have a training schedule for its staff?		4			Review of records/Discussion	
	Does each staff member have a personal training plan approved by a supervisor and reviewed annually?		4			Review of records/Discussion	
	Does the hatchery routinely exchange training details between other hatcheries and agencies?		4			Review of records/Discussion	
	Does the hatchery encourage and reward off-duty training of staff?		4			Review of records/Discussion	
	Does the hatchery conduct monthly staff meetings?		4			Review of records/Discussion	

Table 2 Big Creek Hatchery - Fall Chinook (Big Creek Stock) Compliance With Performance Measures

PM #	Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
		N/A	Yes	?	No		
#26	Are monthly hatchery monitoring visits being conducted by a qualified fish health specialist as described below?						
	Conduct visit at least monthly		4			Review of records/Discussion	
	Monitoring conducted by qualified fish health specialist		4			Review of records/Discussion	
	Examine a representative sample of healthy and moribund fish from each lot.		4			Review of records/Discussion	
	Review fish culture practices with hatchery manager.		4			Review of records/Discussion	
	Report finding and results of necropsies on standard form.		4			Review of records/Discussion	
	Recommend appropriate drug or chemical treatment.		4			Review of records/Discussion	
	Summarize fish health status or stock prior to release or transfer to another facility.		4			Review of records/Discussion	
#27	Are all of the functions of the hatchery yearly monitoring visits being completed as described below?						

Table 2 Big Creek Hatchery - Fall Chinook (Big Creek Stock) Compliance With Performance Measures

		N/A	Yes	?	No		
	Annually examine each broodstock for the presence of reportable viral pathogens.		4			Review of records/Discussion	
	Annually screen each salmon broodstock for the presence of <i>Renibacterium salmoninarum</i> .		4			Review of records/Discussion	
	Conduct inspection by or under the supervision of qualified fish health specialist.		4			Review of records/Discussion	

Table 2 Big Creek Hatchery - Fall Chinook (Big Creek Stock) Compliance With Performance Measures

PM #	Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
		N/A	Yes	?	No		
#28	<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>						
					4	Discussion	Provide pathogen-free water for incubation (300 gpm)
			4			Inspection of facilities/Discussion	
					4	Inspection of facilities/Discussion	Install foot baths
					4	Inspection of facilities/Discussion	Follow IHOT protocols for sanitation of equipment and rain gear utilized in broodstock handling or spawning prior to its use elsewhere in the hatchery
			4			Inspection of facilities/Discussion	

Table 2 Big Creek Hatchery - Fall Chinook (Big Creek Stock) Compliance With Performance Measures

		N/A	Yes	?	No		
	Is equipment, including vehicles used to transfer fish between facilities, disinfected prior to use with any other fish lots or at any other location?	4				No transfers	
	Are rearing vessels sanitized after fish are removed and prior to introducing a new fish lot or stock?				4	Inspection of facilities/Discussion	Follow IHOT protocols for sanitation of rearing vessels after fish are removed and prior to introducing a new fish lot or stock
	Are dead fish properly disposed of?		4			Inspection of facilities/Discussion	

Table 2 Big Creek Hatchery - Fall Chinook (Big Creek Stock) Compliance With Performance Measures

PM #	Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
		N/A	Yes	?	No		
#29	<p>Are water quality parameters being followed?</p> <p>Are the following water quality parameters within criteria? (PM #5a-5g)</p>						
	<p>Water temperature</p> <p>Dissolved gases</p> <p>Chemistry</p> <p>Turbidity</p> <p>Alkalinity and hardness</p> <p>Nitrite</p> <p>Contaminants</p> <p>Go to PM #21</p>		4	4	4	4	4
#30	<p>Are incubation and rearing standards being followed?</p> <p>Are the incubation practices following the IHOT incubation criteria? (PM #18)</p>				4	Review of records/Discussion	See PM #18
	<p>Are the rearing practices following the IHOT criteria? (PM #19)</p> <p>Go to rearing practices PM #18-PM #19</p>		4			Review of records/Discussion	
#31	<p>Are egg and fish transfer/release requirements met?</p>		4			Discussion	

Table 2 Big Creek Hatchery - Fall Chinook (Big Creek Stock) Compliance With Performance Measures

Table 2 Big Creek Hatchery - Fall Chinook (Big Creek Stock) Compliance With Performance Measures

PM #	Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
		N/A	Yes	?	No		
#32	<p>Is the hatchery's program outlined in a subbasin management plan?</p> <p>Go to subbasin plan PM #1</p>		4			Columbia Basin System Planning Production Plan	
#33	<p>Is the hatchery operating under a current hatchery operational plan?</p> <p>Go to operational plan PM #2</p>		4			Review IHOT Operations Plan	
#34	<p>Is a hatchery monitoring and evaluation plan in place?</p> <p>Go to hatchery monitoring and evaluation plan PM #3</p>		4			CWT and Missing Group Reports	

Table 2 Big Creek Hatchery - Fall Chinook (Big Creek Stock) Compliance With Performance Measures

PM #	Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
		N/A	Yes	?	No		
#35	<p>Does the hatchery program meet requirements established in the 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?</p> <p>Does the hatchery program meet the requirements for the following?</p> <p>Species protocols (PM #1)</p> <p>Stock protocols (PM #1)</p> <p>Broodstock collection location protocols (PM #41b for existing program; PM #39b for new program)</p> <p>Broodstock numbers protocols (PM #42c)</p> <p>Broodstock collection strategy protocols (PM #41b-d for existing program; PM 39b-f for new program)</p>						
			4			Review of records/Discussion	
			4			Review of records/Discussion	
			4			Review of records/Discussion	
			4			Review of records/Discussion	
			4			Review of records/Discussion	

Table 2 Big Creek Hatchery - Fall Chinook (Big Creek Stock) Compliance With Performance Measures

		N/A	Yes	?	No		
	Spawning protocols (PM #42d-e)				4	Review of records/Discussion	See PM #42
	Egg-take protocols (PM #42f-g)				4	Review of records/Discussion	See PM #42

Table 2 Big Creek Hatchery - Fall Chinook (Big Creek Stock) Compliance With Performance Measures

PM #	Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
		N/A	Yes	?	No		
#36	Does 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 date(s), and location of release?						
	Percent smoltification (PM #22a1)				4	Review of records/Discussion	See PM #22a1
	Rearing density (PM #22a2)		4			Review of records/Discussion	
	Disease condition (PM #22a3)		4			Review of records/Discussion	
	Number at release (PM #22a4)		4			Review of records/Discussion	
	Size at release (PM #22a5)		4			Review of records/Discussion	
	Date of release (PM #22a6)		4			Review of records/Discussion	
	Location of release (PM #22a7)		4			Review of records/Discussion	

Table 2 Big Creek Hatchery - Fall Chinook (Big Creek Stock) Compliance With Performance Measures

		N/A	Yes	?	No		
#37	<p>Are fish reared in the subbasin or acclimated in the subbasin?</p> <p>See PM #22b</p>		4			Discussion	
#38	<p>Is the release strategy appropriate for the program?</p> <p>See PM #22c</p>		4			Discussion	

Table 2 Big Creek Hatchery - Fall Chinook (Big Creek Stock) Compliance With Performance Measures

PM #	Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
		N/A	Yes	?	No		
#39	For new programs, has a broodstock collection plan been developed?						
#39a	Is the broodstock collection plan written?	4				Existing Program; does not apply	
	For a non-captive broodstock program:	4				Existing Program; does not apply	
#39b	Was an unbiased, representative sample collected?						
#39c	Was the recommended number of broodstock collected?	4				Existing Program; does not apply	
	For a captive broodstock program:						
#39d	Were captive brood progeny excluded as donors for propagating the next generation of the captive broodstock program?	4				Existing Program; does not apply	
#39e	Were full-sib crosses avoided?	4				Existing Program; does not apply	
#39f	Is the broodstock collection plan understood and being followed by staff?	4				Existing Program; does not apply	

Table 2 Big Creek Hatchery - Fall Chinook (Big Creek Stock) Compliance With Performance Measures

		N/A	Yes	?	No	
#40	For a new program, was the donor selection outline followed in selecting the hatchery broodstock?					
#40a	Is a donor selection plan written?	4				Existing Program; does not apply
#40b	Was the donor selection outline followed in selecting the broodstock?	4				Existing Program; does not apply
#40c	Was the target stock recommended in the donor selection process actually used?	4				Existing Program; does not apply

Table 2 Big Creek Hatchery - Fall Chinook (Big Creek Stock) Compliance With Performance Measures

PM #	Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
		N/A	Yes	?	No		
#41	For existing programs, were the broodstock collection procedures followed?						
#41a	Is the broodstock collection plan written?				4	None provided	Develop written broodstock collection plan
	Does the broodstock collection plan follow the guideline:						
#41b	Was an unbiased, representative sample collected?			4		Discussion - comments support the procedure but not written.	See above
#41c	Was the recommended number of broodstock collected?			4		See above	See above
#41d	Were the broodstock collection procedures in hatchery operation plan understood and followed?			4		See above	See above

Table 2 Big Creek Hatchery - Fall Chinook (Big Creek Stock) Compliance With Performance Measures

PM #	Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance	
		N/A	Yes	?	No			
#42	Was the appropriate number of spawners, male/female ratios, and fertilization protocols used?							
#42a	Are the spawning protocols written?				4	None provided	Develop written spawning protocols	
#42b	Are daily or weekly spawning logs available?		4			Review of records		
#42c	Was the appropriate number of spawners used?		4			Discussion		
#42d	Did you attempt to spawn all collected broodstock and randomize mating with respect to age class, and other traits?		4			Discussion		
#42e	Was the sex-ratio within the limits given in the performance standards?				4	Discussion. Inadequate number of spawner returns.		See PM #4c
#42f	Were the fertilization protocols followed?				4	Discussion. Inadequate number of spawner returns.		See above
#42g	If the hatchery needed to reduce the number of eggs retained, was this done by representative sampling of each male/female cross?		4			Discussion		

Table 2 Big Creek Hatchery - Fall Chinook (Big Creek Stock) Compliance With Performance Measures

PM #	Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
		N/A	Yes	?	No		
#43	<p>Is there a genetics monitoring and evaluation program in place?</p> <p>Is a genetics monitoring and evaluation program available?</p> <p>Does the plan address the following elements listed in 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>None provided</p> <p>Discussion</p> <p>Discussion</p> <p>Discussion</p> <p>Discussion</p>	<p>Develop approved genetics M&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 Big Creek Hatchery - Fall Chinook

(Big Creek Stock)

This section presents the corrective actions required to bring the Big Creek Hatchery - Fall Chinook (Big Creek 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 Big Creek Hatchery - Fall Chinook (Big Creek Stock)

Remedial Action Required	Cost	PMS ¹
Type 1 - Non-compliance issues resulting from items beyond human control or Performance Measures not relevant for this hatchery		
Improve adult returns		4c, 4g, 22a4, 42e, 42f
Install security alarms	---	6
Type 2 - Remedial actions requiring changes in agency policies or procedures		
Develop survival goal for green-egg to eyed-egg, eyed-egg to fry, and smolt to adult	---	4d, 4e, 4h
Follow IHOT procedures for checking other alarms weekly	---	6
Develop alarm log	---	6
Conduct IHOT QA/QC test for feed preparation	---	12
Follow IHOT protocols for not exposing feed or feed containers to light or heat	---	12
Develop written standards for incubation and rearing for the IHOT Operations Plan	---	18-19
Review IHOT flow criteria for the deep trough and vertical stack incubators	---	18
Develop smoltification goal and monitor	---	22a1
Install foot baths	---	28
Follow IHOT protocols for sanitation of equipment and rain gear utilized in broodstock handling or spawning prior to its use elsewhere in the hatchery	---	28
Follow IHOT protocols for sanitation of rearing vessels after fish are removed and prior to introducing a new fish lot or stock	---	28
Develop written broodstock collection plan	---	41

Remedial Action Required	Cost	PMS ²
Type 2		
(cont)		
Develop written spawning protocols	---	42
Develop approved genetics M&E plan	---	43
Type 3 - 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, and contaminants	---	5c-5g
Type 4 - Remedial actions requiring significant capital expenditures		
Rebuild adult holding and spawning facility	\$2.0 million	4b,7
Install intake alarm on Big Creek	\$10,000	6
Install alarms on large rearing pond and adult holding ponds	\$20,000	6
Install alarms on rearing ponds	\$10,000	6
Type 5 - Remedial actions that may require significant capital expenditures but are not clearly definable at this time		
Develop an additional 300 gpm of disease-free water for incubation	---	5h, 28
Review need for new fingerling release channel	---	13

Hatchery Contribution to Fisheries, Spawning Grounds, and Hatcheries

This section presents the audit findings for the Big Creek Hatchery - Fall Chinook (Big Creek 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:
Big Creek Hatchery - Fall Chinook (Big Creek Stock)**

Year	Fisheries (Broodyear)	Spawning Grounds ¹ (Broodyear)	Hatchery ¹ (Broodyear)	Total Combined Contribution (Broodyear)	Smolt to Adult Survival (percent)
1982					
1983					

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

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

1984					
1985					
1986				15,646	0.18
1987				4,426	0.05
1988				17,979	0.17
1989				11,696	0.12
1990					
1991					
1992					

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 Big Creek Hatchery - Fall Chinook (Big Creek 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: Big Creek Hatchery - Fall Chinook
(Big Creek Stock)**

Hatchery	1994	1995	1996
1. Big Creek	\$362,121	\$284,449	\$229,385
2.			
Total Program Costs	\$362,121	\$284,449	\$229,385

The total expenditures for the Big Creek 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, 6c, 6d, and 6e).

Table 6. Annual Operating Expenses - Big Creek Hatchery

Program	1994	1995	1996
1. Fall Chinook (Big Creek)	\$362,121	\$284,449	\$229,385
2. Fall Chinook (Big Creek/Rogue River)	\$210,277	\$136,115	\$214,984
3. Coho	\$140,688	\$131,696	\$157,331
4. Winter Steelhead	\$51,478	\$55,520	\$107,314
5. Sea-run Cutthroat	\$8,134	\$0	\$3,435
Total Hatchery Costs	\$772,698	\$607,779	\$712,449

**Table 5a. Annual Operating Expenses: Big Creek Hatchery - Fall Chinook
(Big Creek Stock)**

Expenditure Occurring at Big Creek Hatchery

Component	1994	1995	1996
Personnel Costs	\$304,339	\$274,232	\$313,356
Operational Costs	\$215,988	\$174,801	\$162,612
Capital Costs	\$61,043	\$1,632	\$4,527
Indirect Costs	\$99,635	\$78,622	\$92,805
Lumped Hatchery Costs			
Lumped Third-Party Costs	\$91,643	\$78,493	\$139,149
Total Hatchery Costs	\$772,698	\$607,779	\$712,449
Source of Funds			
Mitchell Act	88.1%	87.1%	80.5%
Bureau of Reclamation	2.3%	3.0%	2.9%
ODFW (R &E)	9.5%	10.0%	16.6%
Program Production (lb)	123,322	105,552	71,250
Total Production (lb)	263,146	225,532	221,296
Program as Percent of Total	46.9%	46.8%	32.2%

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

Program Costs	\$362,121	\$284,449	\$229,385
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Table 6a. Detailed Expenditures at Big Creek Hatchery by Program

Fall Chinook (Big Creek Stock)

Component	1994	1995	1996
Personnel Costs	\$304,339	\$274,232	\$313,356
Operational Costs	\$215,988	\$174,801	\$162,612
Capital Costs	\$61,043	\$1,632	\$4,527
Indirect Costs	\$99,635	\$78,622	\$92,805
Lumped Hatchery Costs			
Lumped Third-Party Costs	\$91,643	\$78,493	\$139,149
Total Hatchery Costs	\$772,698	\$607,779	\$712,449
Source of Funds			
Mitchell Act	88.1%	87.1%	80.5%
Bureau of Reclamation	2.3%	3.0%	2.9%
ODFW (R &E)	9.5%	10.0%	16.6%
Program Production (lb)	123,322	105,552	71,250
Total Production (lb)	263,146	225,532	221,296
Program as Percent of Total	46.9%	46.8%	32.2%
Program Costs	\$362,121	\$284,449	\$229,385

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 Big Creek Hatchery by Program

Fall Chinook (Big Creek/Rogue River Stock)

Component	1994	1995	1996
Personnel Costs	\$304,339	\$274,232	\$313,356
Operational Costs	\$215,988	\$174,801	\$162,612
Capital Costs	\$61,043	\$1,632	\$4,527
Indirect Costs	\$99,635	\$78,622	\$92,805
Lumped Hatchery Costs			
Lumped Third-Party Costs	\$91,643	\$78,493	\$139,149
Total Hatchery Costs	\$772,698	\$607,779	\$712,449
Source of Funds			
Mitchell Act	88.1%	87.1%	80.5%
Bureau of Reclamation	2.3%	3.0%	2.9%
ODFW (R &E)	9.5%	10.0%	16.6%
Program Production (lb)	71,611	50,509	66,777
Total Production (lb)	263,146	225,532	221,296
Program as Percent of Total	27.2%	22.4%	30.2%
Program Costs	\$210,277	\$136,115	\$214,984

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 Big Creek Hatchery by Program

Coho

Component	1994	1995	1996
Personnel Costs	\$304,339	\$274,232	\$313,356
Operational Costs	\$215,988	\$174,801	\$162,612
Capital Costs	\$61,043	\$1,632	\$4,527
Indirect Costs	\$99,635	\$78,622	\$92,805
Lumped Hatchery Costs			
Lumped Third-Party Costs	\$91,643	\$78,493	\$139,149
Total Hatchery Costs	\$772,698	\$607,779	\$712,449
Source of Funds			
Mitchell Act	88.1%	87.1%	80.5%
Bureau of Reclamation	2.3%	3.0%	2.9%
ODFW (R &E)	9.5%	10.0%	16.6%
Program Production (lb)	47,912	48,869	48,869
Total Production (lb)	263,146	225,532	221,296
Program as Percent of Total	18.2%	21.7%	22.1%
Program Costs	\$140,688	\$131,696	\$157,331

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

Table 6d. Detailed Expenditures at Big Creek Hatchery by Program

Winter Steelhead

Component	1994	1995	1996
Personnel Costs	\$304,339	\$274,232	\$313,356
Operational Costs	\$215,988	\$174,801	\$162,612
Capital Costs	\$61,043	\$1,632	\$4,527
Indirect Costs	\$99,635	\$78,622	\$92,805
Lumped Hatchery Costs			
Lumped Third-Party Costs	\$91,643	\$78,493	\$139,149
Total Hatchery Costs	\$772,698	\$607,779	\$712,449
Source of Funds			
Mitchell Act	88.1%	87.1%	80.5%
Bureau of Reclamation	2.3%	3.0%	2.9%
ODFW (R &E)	9.5%	10.0%	16.6%
Program Production (lb)	17,531	20,602	33,333
Total Production (lb)	263,146	225,532	221,296
Program as Percent of Total	6.7%	9.1%	15.1%
Program Costs	\$51,478	\$55,520	\$107,314

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

Table 6e. Detailed Expenditures at Big Creek Hatchery by Program

Sea-run Cutthroat

Component	1994	1995	1996
Personnel Costs	\$304,339	\$274,232	\$313,356
Operational Costs	\$215,988	\$174,801	\$162,612
Capital Costs	\$61,043	\$1,632	\$4,527
Indirect Costs	\$99,635	\$78,622	\$92,805
Lumped Hatchery Costs			
Lumped Third-Party Costs	\$91,643	\$78,493	\$139,149
Total Hatchery Costs	\$772,698	\$607,779	\$712,449
Source of Funds			
Mitchell Act	88.1%	87.1%	80.5%
Bureau of Reclamation	2.3%	3.0%	2.9%
ODFW (R &E)	9.5%	10.0%	16.6%
Program Production (lb)	2,770	0	1,067
Total Production (lb)	263,146	225,532	221,29
Program as Percent of Total	1.053%	0%	0.482%
Program Costs	\$8,134	\$0	\$3,435

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

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.

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