
COWLITZ TROUT HATCHERY

**A COMPILATION AND SUMMARY OF
IHOT AUDITS FOR SUMMER
STEELHEAD, WINTER STEELHEAD,
AND CUTTHROAT TROUT**

JULY 1998

**HATCHERY EVALUATION REPORT
SUMMARY FOR**

Cowlitz Trout Hatchery
- **Summer Steelhead**
- **Winter Steelhead**
- **Cutthroat Trout**

**A Summarized Compilation of Independent Audit Based on
Integrated Hatchery Operations Team (IHOT) Performance
Measures**

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Section 1

Executive Summary

This report compiles a summary of the findings of three separate Hatchery Evaluation Reports for Summer Steelhead, Winter Steelhead, and Cutthroat Trout at Cowlitz Trout Hatchery. The original Hatchery Evaluation Reports, prepared by Montgomery Watson, presented each species and program separately and include the complete findings. Details on the audit compliance status for each species and program are included in the original reports. The Hatchery Evaluation Reports were based upon audits 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.

The hatchery is located on the Cowlitz River about 42 miles above the mouth. The hatchery is operated by the Washington Department of Fish and Wildlife. The Cowlitz River is a north bank tributary of the lower Columbia River, just downstream of Longview, Washington. The hatchery is used for adult collection, incubation, and rearing of winter steelhead, summer steelhead, sea-run cutthroat, tiger muskie, and channel catfish.

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) in January 1995. 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)*, which 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.

Cowlitz Trout Hatchery – Summer Steelhead, Winter Steelhead, and Cutthroat Trout Results

The Cowlitz Trout facility includes three ponds for adult holding, 24 concrete raceways, 6 intermediate concrete raceways, 4 rearing lakes, and incubation facilities. Cowlitz Hatchery began operation in 1967 as a mitigation facility for dams blocking the Cowlitz River. The goal of the hatchery is to produce adult winter steelhead, summer steelhead, and sea-run cutthroat for sport fisheries. The mitigation goal is to produce 191,000 pounds of smolts and return 38,600 adult steelhead and sea-run cutthroat to the river.

SUMMER STEELHEAD

The Cowlitz Trout Hatchery - Summer Steelhead program was in general compliance with most of the performance measures. In the area of program objectives, the hatchery was not meeting its adult return goal, needed to document its adult contribution and eyed-egg to fry survival, and needed to establish a pre-spawning goal and determine compliance. The audit found that the hatchery was not in compliance with the dissolved oxygen criteria, screen approach criteria, water quality monitoring requirements, predation control facilities, release facilities requirements, and pathology-free water criteria, 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 of the transportation, alarm, and food storage requirements. The hatchery did not meet the flow criteria for incubation. The hatchery did not have a Genetics Monitoring and Evaluation Program.

The specific areas in which the Cowlitz Trout Hatchery - Summer Steelhead program requires remedial actions based on the IHOT performance measures are listed below. These remedial actions are listed in alphabetical order without intent of ranking or otherwise assigning priority:

- Check water alarms daily
- Conduct IHOT QA/QC tests for feed preparation
- Construct bird netting over 857,000 sf of rearing area
- Construct new intake or add an additional 25 sf of screen area
- Develop alarm log
- Develop approved genetic M&E plan
- Develop rearing criteria for shallow troughs used for rearing
- Develop specific incubation and rearing standards for the IHOT Operations Plan
- Document adult contribution
- Document eyed-egg to fry survival
- Establish a pre-spawning survival goal and determine compliance status
- Follow IHOT protocols for disinfection of transport vehicle cab
- Follow IHOT temperature criteria for transport
- Install 22 additional incubators or reduce loading
- Install alarms for large rearing ponds and adult holding ponds
- Install security alarms
- Install telephone pagers
- Insulate demand feeders
- Monitor DO in transport tank
- Monitor and record TGP
- Rebuild aerators
- Replace smolt discharge channel
- Review IHOT Operations Plan and follow

- Revise smoltification goal to meet Section 10 requirements
- Run analysis for water chemistry parameters, alkalinity, hardness, nitrite, and contaminants

Non-compliance issues resulting from items beyond human control or Performance Measures not relevant to this hatchery were not listed above.

WINTER STEELHEAD

The Cowlitz Trout Hatchery - Winter Steelhead program was in general compliance with most of the performance measures. In the area of program objectives, the hatchery was not meeting its adult return goal, needed to document its adult contribution and eyed-egg to fry survival, and needed to establish a pre-spawning goal and determine compliance. The audit found that the hatchery was not in compliance with the dissolved oxygen criteria, screen approach criteria, water quality monitoring requirements, predation control facilities, release facilities requirements, and pathology-free water criteria, 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 of the transportation, alarm, and food storage requirements. The hatchery was not meeting the flow criteria for incubation and needed to collect rearing information for the 3 acre rearing lakes. The hatchery was not collecting an unbiased, representative sample of adults. The hatchery did not have a Genetics Monitoring and Evaluation Program.

The specific areas in which the Cowlitz Trout Hatchery - Winter Steelhead program requires remedial actions based on the IHOT performance measures are listed below. These remedial actions are listed in alphabetical order without intent of ranking or otherwise assigning priority:

- Check water alarms daily
- Collect unbiased, representative sample of adults
- Conduct IHOT QA/QC tests for feed preparation
- Construct bird netting over 857,000 sf of rearing area
- Construct new intake with an additional 25 sf of screen area
- Develop alarm log
- Develop approved genetic M&E plan
- Develop flow and loading numbers for 3-acre rearing lakes
- Develop rearing criteria for shallow troughs used for rearing
- Develop specific incubation and rearing standards for the IHOT Operations Plan
- Document adult contribution
- Document eyed-egg to fry survival
- Establish pre-spawning survival goal and determine compliance status
- Follow IHOT protocols for disinfection of transport vehicle cab
- Follow IHOT temperature criteria for transport
- Improve turbidity in 5-acre rearing ponds
- Increase adult returns
- Install 22 additional incubators or reduce loading
- Install alarms for large rearing ponds and adult holding ponds
- Install security alarms
- Install telephone pagers
- Insulate demand feeders

- Monitor DO in transport tank
- Monitor TGP and record
- Rebuild aerators
- Replace smolt discharge channel
- Review IHOT Operations Plan and follow
- Run analysis for water chemistry parameters, alkalinity, hardness, nitrite, and contaminants

Non-compliance issues resulting from items beyond human control or Performance Measures not relevant to this hatchery were not listed above.

CUTTHROAT TROUT

The Cowlitz Trout Hatchery - Sea-run Cutthroat program was in general compliance with most of the performance measures. In the area of program objectives, the hatchery was not meeting its adult return goal, needed to document its adult contribution and eyed-egg to fry survival, and needed to establish pre-spawning goal and determine compliance. The audit found that the hatchery was not in compliance with the dissolved oxygen criteria, screen approach criteria, water quality monitoring requirements, predation control facilities, release facilities requirements, and pathology-free water criteria, which are all facilities requirements. The hatchery needed to develop specific incubation standards, rearing standards, and adult holding criteria for cutthroat for the IHOT Operations Plan. The hatchery was not meeting the flow criteria for incubation. The hatchery was also not meeting all of the transportation, alarm, and food storage requirements. The hatchery did not have a Genetics Monitoring and Evaluation Program and was not randomizing mating with respect to age class and other traits.

The specific areas in which the Cowlitz Trout Hatchery - Sea-run Cutthroat 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:

- Check water alarms daily
- Collect unbiased, representative sample of adults
- Conduct IHOT QA/QC tests for feed preparation
- Construct bird netting over 857,000 sf
- Construct new intake with an additional 25 sf of screen area
- Develop adult holding criteria for cutthroat
- Develop alarm log
- Develop approved genetic M&E plan
- Develop rearing criteria for shallow troughs used for rearing
- Develop specific incubation and rearing standards for the IHOT Operations Plan
- Document adult contribution
- Document eyed-egg to fry survival
- Establish pre-spawning survival goal and determine compliance status
- Follow IHOT protocols for disinfection of transport vehicle cab
- Follow IHOT temperature criteria for transport
- Heat 100 gpm incubation water by 3°F
- Improve smoltification
- Install alarms for large rearing ponds and adult holding ponds
- Install security alarms

- Install telephone pagers
- Insulate demand feeders
- Monitor DO in transport tank
- Monitor and record TGP
- Randomize mating with respect to age class and other traits
- Rebuild aerators
- Reduce loading for incubation or revise criteria
- Replace smolt discharge channel
- Review and follow IHOT Operations Plan
- Run analysis for water chemistry parameters, alkalinity, hardness, nitrite, and contaminants

Non-compliance issues resulting from items beyond human control or Performance Measures not relevant to this hatchery were not listed above.

Facility Description

Name:	Cowlitz Trout Hatchery
Stock/Species:	Winter Steelhead Summer Steelhead Sea-run Cutthroat
Operating Agency:	Washington Department of Fish and Wildlife
Funding Agency:	Tacoma City Light
Location:	The hatchery is located on the Cowlitz River about 42 miles above the river mouth. The Cowlitz River is a north bank tributary of the lower Columbia River, just downstream of Longview, Washington.
Address:	1182 Spencer Road Winlock, WA 98590
Hatchery Manager:	Mr. Vince Janson
Phone:	(360) 864-6121
Fax:	(360) 864-6122
Purpose:	Cowlitz Hatchery began operation in 1967 as a mitigation facility for dams blocking the Cowlitz River. The goal of the hatchery is to produce adult winter steelhead, summer steelhead, and sea-run cutthroat for sport fisheries. The mitigation goal is to produce 191,000 pounds of smolts and return 38,600 adult steelhead and sea-run cutthroat to the river.
Production Goal:	<p>Winter Steelhead</p> <p>Produce 660,000 smolts for on-station release</p> <p>Produce 500,000 fingerlings for upriver release</p> <p>Produce 60,000 fingerlings for Friends of Cowlitz cooperative</p> <p>Provide 50,000 eyed eggs to co-op programs</p> <p>Summer Steelhead</p> <p>Produce 400,000 smolts for on-station release plus 30,000 for Friends of Cowlitz cooperative</p> <p>Sea-run Cutthroat</p> <p>Produce 120,000 smolts for on-station release</p>

Water Supply:

Water rights total 30,855 gpm from three sources: two well sources and the Cowlitz River. The two well sources provide a combined flow of about 1,500 gpm. In 1991, a 10,000 gpm ozone water treatment system was constructed at the hatchery for control of *Ceratomyxa shasta*.

Facilities:

Adult Holding:	3 concrete adult holding raceways - 7,940 cf each
Incubation:	88 shallow concrete troughs
Early Rearing:	88 shallow concrete troughs
Raceways:	24 concrete raceways - 5,270 cf each 6 concrete intermediate raceways - 2,388 cf each
Rearing Ponds:	4 rearing lakes - 1,624,000 cf each Net pens
Satellite Facilities:	None

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 Cowlitz Trout Hatchery – Summer Steelhead, Winter Steelhead, Cutthroat Trout

This section presents the corrective actions required to bring the Cowlitz Trout Hatchery – Summer Steelhead, Winter Steelhead, and Cutthroat Trout programs into compliance with IHOT performance measures. The remedial actions described here are suggestions developed by the Montgomery Watson Audit Team. The remedial actions and associated cost estimates have not been analyzed or prioritized by the respective operating agencies, fishery managers, or IHOT. There may be additional remedial actions, not included in this report, proposed by the respective operating agencies. 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 3a, 3b, 3c).

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 ($\pm 40\%$).

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 3a. Remedial Actions Required at Cowlitz Trout Hatchery - Summer Steelhead

Remedial Action Required	Cost	PMs¹
Type 1 - Non-compliance issues resulting from items beyond human control or Performance Measures not relevant for this hatchery		
Increase adult returns	----	4h
Type 2 - Remedial actions requiring changes in agency policies or procedures		
Review IHOT Operations Plan and follow	----	2
Document adult contribution	----	4a
Establish a pre-spawning survival goal and determine compliance status	----	4b
Document eyed-egg to fry survival	----	4e
Check water alarms daily	----	6
Develop alarm log	----	6
Develop rearing criteria for shallow troughs used for rearing	----	9,18
Conduct IHOT QA/QC tests for feed preparation	----	12
Develop specific incubation and rearing standards for the IHOT Operations Plan	----	18-19
Revise smoltification goal to meet Section 10 requirements	----	22a1, 22a4
Follow IHOT protocols for disinfection of transport vehicle cab	----	23
Monitor DO in transport tank	----	23
Follow IHOT temperature criteria for transport	----	23
Develop approved genetic M&E plan	----	43

¹ PMs are performance measures that were extracted from the IHOT 1995 report.

Remedial Action Required	Cost	PMS¹
Type 3 - Remedial actions requiring changes in monitoring coverage or interval		
Monitor and record TGP	----	5b
Run analysis for water chemistry parameters, alkalinity, hardness, nitrite, and contaminants	----	5c, 5e-5g
Type 4 - Remedial actions requiring significant capital expenditures		
Construct bird netting over 857,000 sf of rearing area	\$860,000	4f, 11
Rebuild aerators	\$50,000	5b
Install alarms for large rearing ponds and adult holding ponds	\$10,000	6
Install security alarms	\$10,000	6
Install telephone pagers	\$5,000	6
Construct new intake or add an additional 25 sf of screen area	\$500,000	10
Insulate demand feeders	\$10,000	12
Replace smolt discharge channel	\$60,000	13
Install 22 additional incubators or reduce loading	\$150,000	18
Type 5 - Remedial actions that may require significant capital expenditures but are not clearly definable at this time		
None	----	

¹ PMs are performance measures that were extracted from the IHOT 1995 report.

Table 3b. Remedial Actions Required at Cowlitz Trout Hatchery - Winter Steelhead

Remedial Action Required	Cost	PMS ¹
<p>Type 1 - Non-compliance issues resulting from items beyond human control or Performance Measures not relevant for this hatchery</p> <p>Increase adult returns</p>	----	4c, 4h
<p>Type 2 – Remedial actions requiring changes in agency policies or procedures</p> <p>Review IHOT Operations Plan and follow</p> <p>Document adult contribution</p> <p>Establish pre-spawning survival goal and determine compliance status</p> <p>Document eyed-egg to fry survival</p> <p>Check water alarms daily</p> <p>Develop alarm log</p> <p>Develop rearing criteria for shallow troughs used for rearing</p> <p>Develop flow and loading numbers for 3-acre rearing lakes</p> <p>Conduct IHOT QA/QC tests for feed preparation</p> <p>Develop specific incubation and rearing standards for the IHOT Operations Plan</p> <p>Follow IHOT protocols for disinfection of transport vehicle cab</p> <p>Monitor DO in transport tank</p> <p>Follow IHOT temperature criteria for transport</p> <p>Collect unbiased, representative sample of adults</p> <p>Develop approved genetic M&E plan</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>----</p> <p>----</p> <p>----</p> <p>----</p> <p>----</p> <p>----</p> <p>----</p> <p>----</p> <p>----</p> <p>----</p> <p>----</p>	<p>2</p> <p>4a</p> <p>4b</p> <p>4e</p> <p>6</p> <p>6</p> <p>9,18</p> <p>9,19</p> <p>12</p> <p>18-19</p> <p>23</p> <p>23</p> <p>23</p> <p>41</p> <p>43</p>

¹ PMS are performance measures that were extracted from the IHOT 1995 report.

Remedial Action Required	Cost	PMS¹
Type 3 - Remedial actions requiring changes in monitoring coverage or interval		
Monitor TGP and record	----	5b
Run analysis for water chemistry parameters, alkalinity, hardness, nitrite, and contaminants	----	5c, 5e-5g
Type 4 - Remedial actions requiring significant capital expenditures		
Rebuild aerators	\$50,000	5b
Install alarms for large rearing ponds and adult holding ponds	\$10,000	6
Install security alarms	\$10,000	6
Install telephone pagers	\$5,000	6
Construct new intake with an additional 25 sf of screen area	\$500,000	10
Construct bird netting over 857,000 sf of rearing area	\$860,000	11
Insulate demand feeders	\$10,000	12
Replace smolt discharge channel	\$60,000	13
Install 22 additional incubators or reduce loading	\$150,000	18
Type 5 - Remedial actions that may require significant capital expenditures but are not clearly definable at this time		
Improve turbidity in 5-acre rearing ponds	----	22a1, 22a4

¹ PMS are performance measures that were extracted from the IHOT 1995 report.

Table 3c. Remedial Actions Required at Cowlitz Trout Hatchery - Sea-run Cutthroat

Remedial Action Required	Cost	PMS¹
Type 1 - Non-compliance issues resulting from items beyond human control or Performance Measures not relevant for this hatchery		
Increase adult returns	----	4c, 4h, 42e
Type 2 – Remedial actions requiring changes in agency policies or procedures		
Review and follow IHOT Operations Plan	----	2
Document adult contribution	----	4a
Establish pre-spawning survival goal and determine compliance status	----	4b
Document eyed-egg to fry survival	----	4e
Check water alarms daily	----	6
Develop alarm log	----	6
Develop adult holding criteria for cutthroat	----	7
Develop rearing criteria for shallow troughs used for rearing	----	9,18
Conduct IHOT QA/QC tests for feed preparation	----	12
Develop specific incubation and rearing standards for the IHOT Operations Plan	----	18-19
Reduce loading for incubation or revise criteria	----	18
Follow IHOT protocols for disinfection of transport vehicle cab	----	23
Monitor DO in transport tank	----	23
Follow IHOT temperature criteria for transport	----	23
Collect unbiased, representative sample of adults	----	41
Randomize mating with respect to age class and other traits	----	42
Develop approved genetic M&E plan	----	43

¹ PMS are performance measures that were extracted from the IHOT 1995 report.

Remedial Action Required	Cost	PMS¹
Type 3 - Remedial actions requiring changes in monitoring coverage or interval		
Monitor and record TGP	----	5b
Run analysis for water chemistry parameters, alkalinity, hardness, nitrite, and contaminants	----	5c, 5e-5g
Type 4 - Remedial actions requiring significant capital expenditures		
Heat 100 gpm incubation water by 3°F	\$20,000	5a
Rebuild aerators	\$50,000	5b
Install alarms for large rearing ponds and adult holding ponds	\$10,000	6
Install security alarms	\$10,000	6
Install telephone pagers	\$5,000	6
Construct new intake with an additional 25 sf of screen area	\$500,000	10
Construct bird netting over 857,000 sf	\$860,000	11
Insulate demand feeders	\$10,000	12
Replace smolt discharge channel	\$60,000	13
Type 5 - Remedial actions that may require significant capital expenditures but are not clearly definable at this time		
Improve smoltification	----	22a21

¹ PMS are performance measures that were extracted from the IHOT 1995 report.

Hatchery Contribution to Fisheries, Spawning Grounds, and Hatcheries

This section presents the audit findings for the Cowlitz Trout Hatchery – Summer Steelhead, Winter Steelhead, and Cutthroat Trout program contribution of adult fish to fisheries, local fisheries, spawning grounds, and hatcheries (Table 4a, 4b, 4c). 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 4a. Adult Contribution to Fisheries, Spawning Grounds, and Hatcheries:
Cowlitz Trout Hatchery - Summer Steelhead**

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					
1988					
1989					
1990	8,426	?	No broodyear information provided	?	1.83
1991	11,620	?	No broodyear information provided	?	1.91
1992	8,534	?	No broodyear information provided	?	2.28

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.

**Table 4b. Adult Contribution to Fisheries, Spawning Grounds, and Hatcheries:
Cowlitz Trout Hatchery - Winter Steelhead**

Year	Fisheries¹ (Broodyear)	Spawning Grounds¹ (Broodyear)	Hatchery¹ (Broodyear)	Total Combined Contribution² (Broodyear)	Smolt to Adult Survival (percent)
1984					
1985					
1986					
1987					
1988					
1989					
1990	14,482	?	No broodyear information provided	?	1.63
1991	22,537	?	No broodyear information provided	?	1.88
1992	16,350	?	No broodyear information provided	?	1.91

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.

**Table 4c. Adult Contribution to Fisheries, Spawning Grounds, and Hatcheries:
Cowlitz Trout Hatchery - Sea-run Cutthroat**

Year	Fisheries¹ (Broodyear)	Spawning Grounds¹ (Broodyear)	Hatchery¹ (Broodyear)	Total Combined Contribution² (Broodyear)	Smolt to Adult Survival (percent)
1984					
1985					
1986					
1987					
1988					
1989					
1990	?	?	No broodyear information provided	?	2.84
1991	?	?	No broodyear information provided	?	2.26
1992	?	?	No broodyear information provided	?	0.62

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, and 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. The total expenditures for the Cowlitz Trout Hatchery are presented in Table 5 by program. The detailed breakdown of program expenditures at this hatchery are presented in separate tables (Tables 6a, 6b, and 6c).

Table 5. Annual Operating Expenses - Cowlitz Trout Hatchery

Program	1993	1994	1995
1. Winter Steelhead	\$454,998	\$517,515	\$509,592
2. Summer Steelhead	\$257,242	\$191,200	\$339,404
3. Sea-run cutthroat	\$90,838	\$141,063	\$123,508
4.			
5.			
Total Hatchery Costs	\$803,884	\$849,778	\$972,505

Table 6a. Detailed Expenditures at Cowlitz Trout Hatchery by Program

Summer Steelhead

Component	1993	1994	1995
Personnel Costs	\$336,008	\$381,337	\$366,802
Operational Costs	\$215,590	\$183,130	\$248,820
Capital Costs	\$16,769	\$35,586	\$98,059
Indirect Costs			
Lumped Hatchery Costs ¹			
Lumped Third-Party Costs	\$235,517	\$249,725	\$258,824
Total Hatchery Costs	\$803,884	\$849,778	\$972,505
Source of Funds			
Tacoma City Light	100%	100%	100%
Program Production (lb)	99,819	59,696	92,223
Total Production (lb)	311,591	265,480	264,270
Program as Percent of Total	32.0%	22.5%	34.9%
Program Costs	\$257,242	\$191,200	\$339,404

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 Cowlitz Trout Hatchery by Program

Winter Steelhead

Component	1993	1994	1995
Personnel Costs	\$336,008	\$381,337	\$366,802
Operational Costs	\$215,590	\$183,130	\$248,820
Capital Costs	\$16,769	\$35,586	\$98,059
Indirect Costs			
Lumped Hatchery Costs ¹			
Lumped Third-Party Costs	\$235,517	\$249,725	\$258,824
Total Hatchery Costs	\$803,884	\$849,778	\$972,505
Source of Funds			
Tacoma City Light	100%	100%	100%
Program Production (lb)	176,441	161,626	138,600
Total Production (lb)	311,591	265,480	264,270
Program as Percent of Total	56.6%	60.9%	52.4%
Program Costs	\$454,998	\$517,515	\$509,592

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 Cowlitz Trout Hatchery by Program

Sea-run Cutthroat

Component	1993	1994	1995
Personnel Costs	\$336,008	\$381,337	\$366,802
Operational Costs	\$215,590	\$183,130	\$248,820
Capital Costs	\$16,769	\$35,586	\$98,059
Indirect Costs			
Lumped Hatchery Costs ¹			
Lumped Third-Party Costs	\$235,517	\$249,725	\$258,824
Total Hatchery Costs	\$803,884	\$849,778	\$972,505
Source of Funds			
Tacoma City Light	100%	100%	100%
Program Production (lb)	35,331	44,158	33,447
Total Production (lb)	311,591	265,480	264,270
Program as Percent of Total	11.3	16.6	12.7
Program Costs	\$90,838	\$141,063	\$123,508

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