
OXBOW HATCHERY

**A COMPILATION AND SUMMARY OF
IHOT AUDITS FOR SPRING CHINOOK AND
COHO**

JULY 1998

HATCHERY EVALUATION REPORT SUMMARY FOR

Oxbow Hatchery

- **Spring Chinook (Clackamas Stock)**
 - **Coho (Umatilla Releases)**
- **Coho (Tanner Creek/Sandy River Stock)**
 - **Coho (Tanner Creek Stock)**
 - **Coho (Bonneville Releases)**

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

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Executive Summary

This report compiles a summary of the findings of five separate Hatchery Evaluation Reports for Spring Chinook and Coho (Tanner Creek Stock -Umatilla Releases, Tanner Creek/Sandy River Stock – CEDC Releases, Tanner Creek Stock – CEDC Releases, and Tanner Creek Stock - Bonneville Releases) at Oxbow 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.

Oxbow Hatchery is located approximately 2 miles east of Cascade Locks, Oregon and is operated by the Oregon Department of Fish and Wildlife. Herman Creek Ponds, Lower Herman Creek Ponds, and Wahkeena Pond are operated as satellite facilities to Oxbow Hatchery. The hatchery is used for incubation and early rearing of Spring Chinook, Fall Chinook, and Coho.

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.

Oxbow Hatchery - Spring Chinook (Clackamas Stock) and Coho (Tanner Creek Stock -Umatilla Releases, Tanner Creek Stock – CEDC Releases, Tanner Creek/Sandy River Stock – CEDC Releases, and Tanner Creek Stock - Bonneville Releases) Results

The Oxbow Hatchery includes 12 concrete raceways, incubation, and early rearing facilities. Oxbow Hatchery was originally constructed in 1913 to provide additional rearing facilities for Bonneville Hatchery. It was relocated to its present site in 1937 following construction of Bonneville Dam. Oxbow was operated as part of the Columbia River Fisheries Development Program (Mitchell Act) - a program to enhance declining fish runs in the Columbia River Basin.

SPRING CHINOOK (CLACKAMAS STOCK)

The Oxbow Hatchery - Spring Chinook (Clackamas Stock) program was in general compliance with most of the performance measures. The audit found that the hatchery was not in compliance with the water quality monitoring requirements, needed double screen for a portion of the raceways, and needed bird netting for the raceways. The hatchery was not in compliance with the requirements for regional oversight of feed manufacturing, and needed to develop specific incubation and rearing standards. In the area of fish health, the hatchery was not using foot baths for the incubation facility.

The specific areas in which the Oxbow Hatchery - Spring Chinook (Clackamas 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:

- Develop and maintain alarm log
- Develop specific rearing standards for the IHOT Operations Plan
- Develop specific incubation standards for the IHOT Operations Plan; review loading criteria for incubation
- Follow IHOT recommendations for regional oversight of feed production
- Install bird netting over raceways
- Install double screen on 12 raceways used for spring chinook
- Monitor and document DO and TGP levels
- Provide foot baths for incubation facility
- Review IHOT temperature criteria for rearing
- 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.

COHO (TANNER CREEK STOCK – UMATILLA RELEASES)

The Oxbow Hatchery - Coho (Tanner Creek Stock - Umatilla Releases) program was in general compliance with most of the performance measures. The audit found that the hatchery was not in compliance with the water quality monitoring requirements, needed double screen for Herman Creek Ponds, and needed to construct rearing or acclimation ponds for Umatilla River releases. The hatchery was not in compliance with the requirements for regional oversight of feed manufacturing and needed to develop specific rearing standards, smoltification goal, and smoltification monitoring program.

The specific areas in which the Oxbow Hatchery - Coho (Tanner Creek Stock - Umatilla Releases) 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:

- Develop and maintain alarm log
- Develop smoltification goal and implement monitoring program
- Develop specific rearing standards for the IHOT Operations Plan
- Follow IHOT recommendations for regional oversight of feed production
- Monitor and document DO and TGP for Oxbow Springs and Herman Creek
- Provide second set of screens on lowermost pond
- Review IHOT temperature criteria for rearing
- Review potential for providing rearing and acclimation in the Umatilla subdivision.
- Run analysis for chemistry parameters, turbidity, alkalinity, hardness, nitrite, and contaminants for Oxbow Springs and Herman Creek

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

COHO (TANNER CREEK/SANDY RIVER STOCK – CEDC RELEASE)

The Oxbow Hatchery - Coho (Mixed Tanner Creek and Sandy River Stocks: CEDC Release) program was in general compliance with most of the performance measures. In the area of program objectives, the hatchery needed to document adult contribution, fry-to-smolt survival, and smolt-to-adult survival. The audit found that the hatchery was not in compliance with the water quality monitoring requirements and needed double screen for upper Herman Creek Ponds. The hatchery was not in compliance with the requirements for regional oversight of feed manufacturing and needed to develop specific incubation and rearing standards. The hatchery did not have foot baths in the incubation facility.

The specific areas in which the Oxbow Hatchery - Coho (Mixed Tanner Creek and Sandy River Stocks: CEDC Release) 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:

- Develop and maintain alarm log
- Develop specific incubation standards for the IHOT Operations Plan
- Develop specific rearing standards for the IHOT Operations Plan
- Document adult contribution
- Document fry-to-smolt survival and compare with goal
- Document smolt-to-adult survival

- Follow IHOT recommendations for regional oversight of feed production
- Improve green-egg to eyed-egg survival
- Install double screen on upper Herman Creek ponds
- Monitor and document DO and TGP levels
- Provide foot baths
- 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.

COHO (TANNER CREEK STOCK – CEDC RELEASES)

The Oxbow Hatchery - Coho (Tanner Creek Stock: CEDC releases) program was in general compliance with most of the performance measures. In the area of program objectives, the hatchery needed to document adult contribution. The audit found that the hatchery was not in compliance with the water quality monitoring requirements and needed double screen for upper Herman Creek Ponds. The hatchery was not in compliance with the requirements for regional oversight of feed manufacturing and needed to develop specific rearing standards, smoltification goal, and smoltification monitoring program.

The specific areas in which the Oxbow Hatchery - Coho (Tanner Creek Stock: CEDC releases) 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:

- Develop and maintain alarm log
- Develop specific rearing standards for the IHOT Operations Plan
- Document adult contribution
- Follow IHOT recommendations for regional oversight of feed production
- Install double screen on upper Herman Creek ponds
- Monitor and document DO and TGP levels
- 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.

COHO (TANNER CREEK STOCK – BONNEVILLE RELEASES)

The Oxbow Hatchery - Coho (Tanner Creek Stock: Bonneville Releases) program was in general compliance with most of the performance measures. The audit found that the hatchery was not in compliance with the water quality monitoring requirements and needed double screen for Herman Creek Ponds, The hatchery was not in compliance with the requirements for regional oversight of feed manufacturing, and needed to develop specific rearing standards.

The specific areas in which the Oxbow Hatchery - Coho (Tanner Creek Stock: Bonneville Releases) 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:

- Develop and maintain alarm log

- Develop smoltification goal and implement program to monitor smoltification
- Develop specific rearing standards for the IHOT Operations Plan
- Follow IHOT recommendations for regional oversight of feed production
- Monitor and document DO and TPG for Oxbow Springs and Herman Creek
- Provide second set of screens for upper Herman Ponds
- Review IHOT temperature criteria for rearing
- Run analysis for chemistry parameters, turbidity, alkalinity, hardness, nitrite, and contaminants for Oxbow Springs and Herman Creek

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

Section 2
Facility Description

Name: Oxbow Hatchery

Stock/Species: Coho - Tanner Creek Stock (Umatilla Releases)
Coho - Tanner Creek Stock (CEDC Releases)
Coho - Mixed Tanner Creek/Sandy River Stock (CEDC Releases)
Coho - Tanner Creek Stock (Bonneville Releases)
Spring Chinook (Clackamas Stock)

Operating Agency: Oregon Department of Fish & Wildlife

Funding Agency: Mitchell Act

Location: Oxbow Hatchery is located approximately 2 miles east of Cascade Locks, Oregon.

Address: Oxbow Fish Hatchery
Oregon Department of Fish & Wildlife
Star Route, Box 750
Cascade Locks, OR 97014

Hatchery Manager: Mr. Larry Dimmick

Phone: (541) 374-8540
Fax: (503) 374-8827

Purpose: Oxbow Hatchery was originally constructed in 1913 to provide additional rearing facilities for Bonneville Hatchery. It was relocated to its present site in 1937 following construction of Bonneville Dam. Oxbow was operated as part of the Columbia River Fisheries Development Program (Mitchell Act) - a program to enhance declining fish runs in the Columbia River Basin.

The goal of the hatchery is to produce coho and spring chinook that will contribute to the Northeast Pacific and Columbia River commercial, tribal, and sports fisheries.

Production Goal:

Coho

Produce 2 million fingerlings (83,850 lb) at Upper Herman Creek for transfer to Bonneville

Produce 0.825 million fingerlings (at Lower Herman Creek Ponds (Tanner Creek Stock) for transfer to Lower Columbia River net pens

Produce 0.600 million fingerlings at Lower Herman Creek Ponds (Mixed Tanner Creek and Sandy River Stock) for transfer to Lower Columbia River net pens

Produce 500,000 smolts (33,300 lb) at Lower Herman Creek Ponds for release into the Umatilla River.

Spring Chinook

Produce 637,000 fingerlings (5,095 lb) for transfer to Clackamas Hatchery

Water Supply:

The hatchery obtains its water supply from Oxbow Springs through gravity flow. The Oxbow Springs flow dwindles to about 300 gpm in the summer and fall and is not used for rearing fish during that period.

Facilities:

Adult Holding:	None
Incubation:	32 deep troughs - 28 cf each 32 shallow troughs - 13 cf each
Early Rearing:	32 deep troughs - 28 cf each 32 shallow troughs - 13 cf each
Raceways:	12 concrete raceways - 4,695 cf each
Rearing Ponds:	None

Satellite Facilities:

Herman Creek Satellite

2 concrete raceways - 2,604 each

2 Asphalt ponds - 46,900 cf each

Lower Herman Creek Satellite

3 concrete ponds - 10,800 cf each

Wahkeena Satellite

1 18 acre pond

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 Oxbow Hatchery - Spring Chinook (Clackamas Stock) and Coho (Tanner Creek Stock -Umatilla Releases, Tanner Creek Stock – CEDC Releases, Tanner Creek/Sandy River Stock – CEDC Releases, and Tanner Creek Stock - Bonneville Releases)

This section presents the corrective actions required to bring the Oxbow Hatchery - Spring Chinook (Clackamas Stock) and Coho (Tanner Creek Stock -Umatilla Releases, Tanner Creek Stock – CEDC Releases, Tanner Creek/Sandy River Stock – CEDC Releases, and Tanner Creek Stock - Bonneville Releases) 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 (Tables 3a, 3b, 3c, 3d, and 3e).

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 Oxbow Hatchery - Spring Chinook
(Clackamas Stock)**

Remedial Action Required	Cost	PMs¹
Type 1 - Non-compliance issues resulting from items beyond human control or Performance Measures not relevant for this hatchery Install security alarms	----	
Type 2 - Remedial actions requiring changes in agency policies or procedures Develop and maintain alarm log Review IHOT temperature criteria for rearing Follow IHOT recommendations for regional oversight of feed production Develop specific incubation standards for the IHOT Operations Plan; review loading criteria for incubation Develop specific rearing standards for the IHOT Operations Plan Provide foot baths for incubation facility	---- ---- ---- ---- ---- ----	6 5a 12 18 19 28
Type 3 - Remedial actions requiring changes in monitoring coverage or interval Monitor and document DO and TGP levels Run analysis for water chemistry parameters, alkalinity, hardness, nitrite, and contaminants	---- ----	5b 5c, 5e, 5f, & 5g

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

Remedial Action Required	Cost	PMS¹
Type 4 - Remedial actions requiring significant capital expenditures		
Install double screen on 12 raceways used for spring chinook	\$2,400	10
Install bird netting over raceways	\$30,000	11
Type 5 - Remedial actions that may require significant capital expenditures but are not clearly definable at this time		
None	----	

Table 3b. Remedial Actions Required at Oxbow Hatchery - Coho (Tanner Creek Stock - Umatilla Releases)

Remedial Action Required	Cost	PMS²
Type 1 - Non-compliance issues resulting from items beyond human control or Performance Measures not relevant for this hatchery		
Install security alarms	----	6
Type 2 - Remedial actions requiring changes in agency policies or procedures		
Review IHOT temperature criteria for rearing	----	5a
Develop and maintain alarm log	----	6
Follow IHOT recommendations for regional oversight of feed production	----	12
Develop specific rearing standards for the IHOT Operations Plan	----	19, 22a2
Develop smoltification goal and implement monitoring program	----	22a1
Type 3 - Remedial actions requiring changes in monitoring coverage or interval		
Monitor and document DO and TGP for Oxbow Springs and Herman Creek	----	5b
Run analysis for chemistry parameters, turbidity, alkalinity, hardness, nitrite, and contaminants for Oxbow Springs and Herman Creek	----	5c, 5d, 5e, 5f, 6g

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

² PMS are performance measures that were extracted from the IHOT 1995 report.

Remedial Action Required	Cost	PMS²
Type 4 - Remedial actions requiring significant capital expenditures		
Provide second set of screens on lowermost pond	\$200	10
Construct rearing and/or acclimation for Umatilla River releases	\$1,000,000	22b
Type 5 - Remedial actions that may require significant capital expenditures but are not clearly definable at this time		
Review potential for providing rearing and acclimation in the Umatilla subdivision.	----	22b

Table 3c Remedial Actions Required at Oxbow Hatchery - Coho (Mixed Tanner Creek and Sandy River Stocks: CEDC Release)

Remedial Action Required	Cost	PMS¹
Type 1 - Non-compliance issues resulting from items beyond human control or Performance Measures not relevant for this hatchery		
Install security alarms	----	
Type 2 - Remedial actions requiring changes in agency policies or procedures		
Document adult contribution	----	4a
Document fry-to-smolt survival and compare with goal	----	4e
Document smolt-to-adult survival	----	4h
Develop and maintain alarm log	----	6
Follow IHOT recommendations for regional oversight of feed production	----	12
Develop specific incubation standards for the IHOT Operations Plan	----	18
Develop specific rearing standards for the IHOT Operations Plan	----	19
Provide foot baths	----	28
Type 3 - Remedial actions requiring changes in monitoring coverage or interval		
Monitor and document DO and TGP levels	----	5b

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

Remedial Action Required	Cost	PMS¹
Run analysis for water chemistry parameters, alkalinity, hardness, nitrite, and contaminants	----	5c, 5e, 5f, & 5g
Type 4 - Remedial actions requiring significant capital expenditures		
Install double screen on upper Herman Creek ponds	\$400	10
Type 5 - Remedial actions that may require significant capital expenditures but are not clearly definable at this time		
Improve green-egg to eyed-egg survival	----	4d

Table 3d. Remedial Actions Required at Oxbow Hatchery - Coho (Tanner Creek Stock: CEDC releases)

Table 3e. Remedial Actions Required at Oxbow Hatchery - Coho (Tanner Creek Stock: Bonneville Releases)

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>Install security alarms</p>	----	6
<p>Type 2 - Remedial actions requiring changes in agency policies or procedures</p> <p>Review IHOT temperature criteria for rearing</p> <p>Develop and maintain alarm log</p> <p>Follow IHOT recommendations for regional oversight of feed production</p> <p>Develop specific rearing standards for the IHOT Operations Plan</p> <p>Develop smoltification goal and implement program to monitor smoltification</p>	<p>----</p> <p>----</p> <p>----</p> <p>----</p> <p>----</p>	<p>5a</p> <p>6</p> <p>12</p> <p>19</p> <p>22a1</p>
<p>Type 3 - Remedial actions requiring changes in monitoring coverage or interval</p> <p>Monitor and document DO and TGP for Oxbow Springs and Herman Creek</p> <p>Run analysis for chemistry parameters, turbidity, alkalinity, hardness, nitrite, and contaminants for Oxbow Springs and Herman Creek</p>	<p>----</p> <p>----</p>	<p>5b</p> <p>5c, 5d, 5e, 5f,6g</p>
<p>Type 4 - Remedial actions requiring significant capital expenditures</p> <p>Provide second set of screens for upper Herman Ponds</p>	\$400	10
<p>Type 5 - Remedial actions that may require significant capital expenditures but are not clearly definable at this time</p> <p>None</p>	----	

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 Oxbow Hatchery - Spring Chinook (Clackamas Stock) and Coho (Tanner Creek Stock -Umatilla Releases, Tanner Creek Stock – CEDC Releases, Tanner Creek/Sandy River Stock – CEDC Releases, and Tanner Creek Stock - Bonneville Releases) programs contribution of adult fish to fisheries, local fisheries, spawning grounds, and hatcheries (Tables 4a, 4b, 4c, 4d, and 4e). 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:
Oxbow Hatchery - Spring Chinook (Clackamas Stock)**

**Table 4b. Adult Contribution to Fisheries, Spawning Grounds, and Hatcheries:
Oxbow Hatchery - Coho (Tanner Creek Stock - Umatilla Releases)**

Year	Fisheries¹ (Broodyear)	Spawning Grounds¹ (Broodyear)	Hatchery¹ (Broodyear)	Total Combined Contribution² (Broodyear)	Smolt to Adult Survival (percent)
1983					
1984					
1985					
1986					
1987	See Cascade Hatchery	See Cascade Hatchery	See Cascade Hatchery	See Cascade Hatchery	See Cascade Hatchery
1988	See Cascade Hatchery	See Cascade Hatchery	See Cascade Hatchery	See Cascade Hatchery	See Cascade Hatchery
1989	See Cascade Hatchery	See Cascade Hatchery	See Cascade Hatchery	See Cascade Hatchery	See Cascade Hatchery
1990	See Cascade Hatchery	See Cascade Hatchery	See Cascade Hatchery	See Cascade Hatchery	See Cascade Hatchery
1991	See Cascade Hatchery	See Cascade Hatchery	See Cascade Hatchery	See Cascade Hatchery	See Cascade Hatchery
1992					

**Table 4c. Adult Contribution to Fisheries, Spawning Grounds, and Hatcheries:
Oxbow Hatchery - Coho (Mixed Tanner Creek and Sandy River Stocks: CEDC
Release)**

Year	Fisheries³ (Broodyear)	Spawning Grounds¹ (Broodyear)	Hatchery¹ (Broodyear)	Total Combined Contribution⁴ (Broodyear)	Smolt to Adult Survival (percent)
1984					

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.

³ Data obtained from Missing Production Groups Annual Report or from the Regional Mark Information System database.

⁴ Total combined adult contribution; presented when it is not possible to subdivide the contribution into fisheries, spawning grounds, and hatchery contributions.

1985					
1986					
1987	No information provided	No information provided	No information provided	No information provided	No information provided
1988	No information provided	No information provided	No information provided	No information provided	No information provided
1989	No information provided	No information provided	No information provided	No information provided	No information provided
1990	No information provided	No information provided	No information provided	No information provided	No information provided
1991	No information provided	No information provided	No information provided	No information provided	No information provided
1992					

**Table 4d. Adult Contribution to Fisheries, Spawning Grounds, and Hatcheries:
Oxbow Hatchery - Coho (Tanner Creek Stock: CEDC releases)**

Year	Fisheries¹ (Broodyear)	Spawning Grounds¹ (Broodyear)	Hatchery¹ (Broodyear)	Total Combined Contribution² (Broodyear)	Smolt to Adult Survival (percent)
1983					
1984					
1985					
1986					
1987	No information provided	No information provided	No information provided	No information provided	No information provided
1988	No information provided	No information provided	No information provided	No information provided	No information provided
1989	No information provided	No information provided	No information provided	No information provided	No information provided

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.

1990	No information provided	No information provided	No information provided	No information provided	No information provided
1991	No information provided	No information provided	No information provided	No information provided	No information provided
1992					

**Table 4e. Adult Contribution to Fisheries, Spawning Grounds, and Hatcheries:
Oxbow Hatchery - Coho (Tanner Creek Stock: Bonneville Releases)**

Year	Fisheries¹ (Broodyear)	Spawning Grounds¹ (Broodyear)	Hatchery¹ (Broodyear)	Total Combined Contribution² (Broodyear)	Smolt to Adult Survival (percent)
1983					
1984					
1985					
1986					
1987	See Bonneville Hatchery	See Bonneville Hatchery	See Bonneville Hatchery	See Bonneville Hatchery	See Bonneville Hatchery
1988	See Bonneville Hatchery	See Bonneville Hatchery	See Bonneville Hatchery	See Bonneville Hatchery	See Bonneville Hatchery
1989	See Bonneville Hatchery	See Bonneville Hatchery	See Bonneville Hatchery	See Bonneville Hatchery	See Bonneville Hatchery
1990	See Bonneville Hatchery	See Bonneville Hatchery	See Bonneville Hatchery	See Bonneville Hatchery	See Bonneville Hatchery
1991	See Bonneville Hatchery	See Bonneville Hatchery	See Bonneville Hatchery	See Bonneville Hatchery	See Bonneville Hatchery
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, 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 Oxbow Hatchery are presented in Table 5 by program. The detailed breakdown of program expenditures for spring chinook and coho at this hatchery are presented in separate tables (Tables 6a, 6b, 6c, 6d, and 6e).

Table 5. Annual Operating Expenses - Oxbow Hatchery

Program	1994	1995	1996
1. Spring Chinook (Clackamas Stock)	\$19,356	\$14,661	\$10,804
2. Coho (Tanner Creek Stock, Umatilla releases)	\$61,589	\$34,095	\$27,782
3. Coho (Tanner Creek Stock, Bonneville releases)	\$219,959	\$143,200	\$98,781
4. Coho (Tanner Creek Stock, CEDC release)	\$158,370	\$88,648	\$70,999
5. Coho (Mixed Tanner Creek and Sandy River Stock, CEDC release)	\$0	\$64,781	\$108,042
Total Hatchery Costs	\$439,918	\$340,952	\$308,692

**Table 6a. Detailed Expenditures at Oxbow Hatchery by Program
Spring Chinook (Clackamas Stock)**

Component	1994	1995	1996
Personnel Costs	\$198,941	\$190,665	\$185,401
Operational Costs	\$156,758	\$90,519	\$57,624
Capital Costs	\$15,821	\$2,890	\$20,842
Indirect Costs	\$68,399	\$56,878	\$44,825
Lumped Hatchery Costs ¹			
Lumped Third-Party Costs	\$0	\$0	\$0
Total Hatchery Costs	\$439,918	\$340,952	\$308,692
Source of Funds			
Program Production (lb)	4,074	5,460	5,096
Total Production (lb)	91,627	125,332	142,229
Program as Percent of Total	4.4%	4.3%	3.5%
Program Costs	\$19,356	\$14,661	\$10,804

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 Oxbow Hatchery by Program
Coho (Tanner Creek Stock: Umatilla Release)**

Component	1994	1995	1996
Personnel Costs	\$198,941	\$190,665	\$185,401
Operational Costs	\$156,758	\$90,519	\$57,624
Capital Costs	\$15,821	\$2,890	\$20,842
Indirect Costs	\$68,399	\$56,878	\$44,825
Lumped Hatchery Costs ¹			
Lumped Third-Party Costs	\$0	\$0	\$0
Total Hatchery Costs	\$439,918	\$340,952	\$308,692
Source of Funds			
Program Production (lb)	13,553	13,466	13,133
Total Production (lb)	91,627	125,332	142,229
Program as Percent of Total	14%	10%	9%
Program Costs	\$61,589	\$34,095	\$27,782

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 Oxbow Hatchery by Program
Coho (Tanner Creek Stock: Bonneville Releases)**

Component	1994	1995	1996
Personnel Costs	\$198,941	\$190,665	\$185,401
Operational Costs	\$156,758	\$90,519	\$57,624
Capital Costs	\$15,821	\$2,890	\$20,842
Indirect Costs	\$68,399	\$56,878	\$44,825
Lumped Hatchery Costs ¹			
Lumped Third-Party Costs	\$0	\$0	\$0
Total Hatchery Costs	\$439,918	\$340,952	\$308,692
Source of Funds			
I			
Program Production (lb)	46,250	53,748	46,250
Total Production (lb)	91,627	125,332	142,229
Program as Percent of Total	50%	42%	32%
Program Costs	\$219,959	\$143,200	\$98,781

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 6d. Detailed Expenditures at Oxbow Hatchery by Program
Coho (Tanner Creek Stock: CEDC Releases)**

Component	1994	1995	1996
Personnel Costs	\$198,941	\$190,665	\$185,401
Operational Costs	\$156,758	\$90,519	\$57,624
Capital Costs	\$15,821	\$2,890	\$20,842
Indirect Costs	\$68,399	\$56,878	\$44,825
Lumped Hatchery Costs ¹			
Lumped Third-Party Costs	\$0	\$0	\$0
Total Hatchery Costs	\$439,918	\$340,952	\$308,692
Source of Funds			
I			
Program Production (lb)	33,000	33,000	33,000
Total Production (lb)	91,627	125,332	142,229
Program as Percent of Total	36%	26%	23%
Program Costs	\$158,370	\$88,648	\$70,999

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 6e. Detailed Expenditures at Oxbow Hatchery by Program
Coho (Mixed Tanner Creek and Sandy River Stocks: CEDC Release)**

Component	1994	1995	1996
Personnel Costs	\$198,941	\$190,665	\$185,401
Operational Costs	\$156,758	\$90,519	\$57,624
Capital Costs	\$15,821	\$2,890	\$20,842
Indirect Costs	\$68,399	\$56,878	\$44,825
Lumped Hatchery Costs ¹			
Lumped Third-Party Costs	\$0	\$0	\$0
Total Hatchery Costs	\$439,918	\$340,952	\$308,692
Source of Funds			
I			
Program Production (lb)	0	24,000	50,000
Total Production (lb)	91,627	125,332	142,229
Program as Percent of Total	0%	19%	35%
Program Costs	\$0	\$64,781	\$108,042

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