
SKAMANIA HATCHERY

A COMPILATION AND SUMMARY OF
HOT AUDITS FOR WINTER
STEELHEAD, SUMMER STEELHEAD,
AND SEA-RUN CUTHROAT TROUT

JULY 1998

**HATCHERY EVALUATION REPORT
SUMMARY FOR**

- Skamania Hatchery**
- **Winter Steelhead**
 - **Summer Steelhead**
 - **Sea-run Cutthroat Trout**

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

SUMMARY REPORT PREPARED BY:
DON SAMPSON
SAMPSEL CONSULTING SERVICES
FOR THE
NORTHWEST POWER PLANNING COUNCIL
JULY 1998

Original IHOT Audit Reports Prepared by:

Montgomery Watson
2375 130th Avenue NE
Suite 200
Bellevue, WA 98005
March 1997

BPA Project Number 95-2
Contract Number 95AC49468

CONTENTS

Section 1 Executive Summary.....

Section 2 Facility Description

Section 3 Remedial Actions

Section 4 Hatchery Contribution to Fisheries, Spawning Grounds and Hatcheries

Section 5 Annual Operating Expenditures

Section 1

Executive Summary

This report compiles a summary of the findings of three separate Hatchery Evaluation Reports for Winter Steelhead, Summer Steelhead, and Sea-run Cutthroat Trout at Skamania 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 North Fork Washougal River about 0.5 mile above the Washougal River and is operated by the Washington Department of Fish and Wildlife. The Washougal River is a north bank tributary of the lower Columbia River, just downstream of Washougal, Washington. The hatchery is used for adult collection, egg incubation, and rearing of winter steelhead, summer steelhead, and sea-run cutthroat.

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.

Skamania Hatchery - Winter Steelhead, Summer Steelhead, and Sea-run Cutthroat Trout Results

The Skamania facility includes three ponds for adult holding, 10 intermediate concrete raceways, 32 concrete raceways, and incubation facilities. Skamania Hatchery was authorized under the Mitchell Act and began operating in 1956 as part of the Columbia River Fisheries Development Program - a program to mitigate for fishery losses caused by hydroelectric system development in the Columbia River Basin. The goal of the hatchery is to produce winter steelhead, summer steelhead, and sea-run cutthroat for harvest by sport anglers.

Winter Steelhead

The Skamania Hatchery - Winter Steelhead program was in general compliance with most of the performance measures. In the area of program objectives, the hatchery did not have a hatchery monitoring and evaluation plan in place, needed to document adult contribution and smolt-to-adult survival, increase fry-to-smolt survival, and develop a pre-spawning survival goal. The audit found that the hatchery was not in compliance with the screen approach and mesh criteria, water quality monitoring requirements, release facility requirements, temperature criteria, predation control facilities, acclimation facilities for out of basin releases, 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, smoltification goal, and smoltification monitoring plan. The hatchery was not meeting its loading criteria for rearing. The hatchery was not in compliance with all the alarm and food storage requirements. The hatchery needed to conduct fish contribution studies. The hatchery did not have a Genetics Monitoring and Evaluation Program.

The specific areas in which the Skamania 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:

- Conduct fishery contribution studies
- Conduct IHOT QA/QC tests for feed preparation
- Construct new screens to meet approach velocity, screen mesh criteria, and active bypass
- Construct volitional release system
- Develop 450 gpm for pathogen-free water for incubation and early rearing
- Develop approved genetics M&E plan
- Develop hatchery monitoring and evaluation plan

- Develop pre-spawning survival goal for IHOT Operations Plan
- Develop smoltification goal and monitor
- Develop specific incubation and rearing standards for the IHOT Operations Plan
- Document adult contribution
- Document smolt-to-adult survival and develop goal
- Follow IHOT requirements for checking water flow alarms daily
- Install telephone pagers
- Monitor and record DO and TGP
- Provide acclimation sites for fish not released in hatchery subbasin
- Provide bird netting on exterior raceways
- Run analysis for water chemistry parameters, turbidity, alkalinity, hardness, nitrite, and contaminants

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

Summer Steelhead

The Skamania Hatchery - Summer Steelhead program was in general compliance with most of the performance measures. In the area of program objectives, the hatchery did not have a Monitoring and Evaluation Plan in place, needed to document adult contribution and smolt-to-adult survival, increase fry-to-smolt survival, and develop a pre-spawning survival goal. The audit found that the hatchery was not in compliance with the screen approach and mesh criteria, water quality monitoring requirements, release facility requirements, temperature criteria, predation control facilities, acclimation facilities for out-of-basin releases, 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, smoltification goal, and smoltification monitoring plan. The hatchery was not meeting its loading criteria for rearing. The hatchery was not in compliance with all the alarm and food storage requirements. The hatchery needed to conduct fish contribution studies. The hatchery also did not have a Genetics Monitoring and Evaluation Program.

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

- Conduct fishery contribution studies
- Conduct IHOT QA/QC tests for feed preparation

- Construct new screens to meet approach velocity, screen mesh criteria, and active bypass
- Construct volitional release system
- Develop 450 gpm for pathogen-free water for incubation and early rearing
- Develop approved genetics M&E plan
- Develop hatchery monitoring and evaluation plan
- Develop pre-spawning survival goal for IHOT Operations Plan
- Develop smoltification goal and monitor
- Develop specific incubation and rearing standards for the IHOT Operations Plan
- Document adult contribution
- Document smolt-to-adult survival and develop goal
- Follow IHOT requirements for checking water flow alarms daily
- Install telephone pagers
- Monitor DO and TGP and record
- Provide acclimation sites for fish not released in hatchery subbasin
- Provide bird netting on exterior raceways (30,000 sf)
- Run analysis for water chemistry parameters, turbidity, alkalinity, hardness, nitrite, and contaminants

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

Sea-Run Cutthroat Trout

The Skamania Hatchery - Sea-run Cutthroat program was in general compliance with most of the performance measures. In the area of program objectives, the hatchery did not have a hatchery monitoring and evaluation plan in place, needed to document adult contribution and smolt-to-adult survival, increase fry-to-smolt survival, revise its green-egg to eyed-egg survival goal, and develop a pre-spawning survival goal. The audit found that the hatchery was not in compliance with the screen approach and mesh criteria, water quality monitoring requirements, release facility requirements, temperature criteria, predation control facilities, acclimation facilities for out-of-basin releases, 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, smoltification goal, and smoltification monitoring plan. The hatchery was not meeting its loading criteria for rearing. The hatchery was not in compliance with all the alarm and food

storage requirements. The hatchery needed to conduct fish contribution studies. The hatchery did not have a Genetics Monitoring and Evaluation Program.

The specific areas in which the Skamania 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:

- Conduct fishery contribution studies
- Conduct IHOT QA/QC tests for feed preparation
- Construct new screens to meet approach velocity, screen mesh criteria, and active bypass
- Construct volitional release system
- Develop 450 gpm for pathogen-free water for incubation and early rearing
- Develop adult holding criteria for IHOT
- Develop approved genetics M&E plan
- Develop hatchery monitoring and evaluation plan
- Develop pre-spawning survival goal for IHOT Operations Plan
- Develop smoltification goal and monitor
- Develop specific incubation and rearing standards for the IHOT Operations Plan
- Document adult contribution
- Document smolt-to-adult survival and develop goal
- Follow IHOT requirements for checking water flow alarms daily
- Install telephone pagers
- Monitor and record DO and TGP
- Provide acclimation sites for fish released in four subbasins
- Provide bird netting on exterior raceways
- Revise green-egg to eyed-egg survival goal for IHOT Operations Plan
- Run analysis for water chemistry parameters, turbidity, alkalinity, hardness, nitrite, and contaminants

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

Facility Description

| | |
|--------------------------|---|
| Name: | Skamania Hatchery |
| Stock/Species: | Winter Steelhead Summer Steelhead Sea-run Cutthroat |
| Operating Agency: | Washington Department of Fish and Wildlife |
| Funding Agency: | Mitchell Act (NMFS) |
| Location: | The hatchery is located the North Fork Washougal River about 0.5 mile above the Washougal River. The Washougal River is a north bank tributary of the lower Columbia River, just downstream of Washougal, Washington. |
| Address: | MP 39L Steelhead Road Washougal, WA 98671 |
| Hatchery Manager: | |
| Phone: | (360) 837-3131 |
| Fax: | (360) 837-3201 |
| Purpose: | Skamania Hatchery was authorized under the Mitchell Act and began operating in 1956 as part of the Columbia River Fisheries Development Program - a program to mitigate for fishery losses caused by hydroelectric system development in the Columbia River Basin. The goal of the hatchery is to produce winter steelhead, summer steelhead, and sea-run cutthroat for harvest by sport anglers. |

Production Goal:

Winter Steelhead

Produce 315,000 smolts for on-station and off-station releases.

Provide 200,000 eyed eggs to Vancouver Hatchery

Summer Steelhead

Produce 300,000 smolts for on-station and off-station releases.

Provide 400,000 eyed eggs to Beaver Creek Hatchery, 400,000 eyed eggs to Vancouver Hatchery, and 300,000 eyed eggs to Ringold Hatchery.

Sea-run Cutthroat

Produce 50,000 smolts for on-station and off-station releases.

Water Supply:

Water rights total 11,670 gpm from two sources: North Fork Washougal River and Vogel River. The Washougal River provides most of the water used by the hatchery. Actual water use averages 9,800 gpm and ranges from 6,650 to 11,460 gpm. Vogel Creek water is used for incubation and early rearing, while Washougal River water is used thereafter until spring release.

Facilities:

| | |
|-----------------------|---|
| Adult Holding: | 3 adult holding raceways - 5,606 cf each |
| Incubation: | 84 16-tray vertical stack incubators 64 shallow troughs |
| Early Rearing: | 64 shallow troughs 10 circular tanks - 1,028 gal each |
| Raceways: | 10 intermediate raceways - 216 cf each 32 raceways - 1,913 cf each |
| Rearing Ponds: | None |
| Satellite Facilities: | None |

Section 3
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 Skamania Hatchery - Winter Steelhead, Summer Steelhead, and Sea-run Cutthroat Trout

This section presents the corrective actions required to bring the Skamania Hatchery - Winter Steelhead, Summer Steelhead, and Sea-run 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, and 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 Skamania Hatchery - Winter 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 | | |
| Improve adult returns | ---- | 4g, 4i |
| Install security alarms | ---- | 6 |
| Type 2 - Remedial actions requiring changes in agency policies or procedures | | |
| Develop hatchery monitoring and evaluation plan | ---- | 3 |
| Document adult contribution | ---- | 4a |
| Develop pre-spawning survival goal for IHOT Operations Plan | ---- | 4b |
| Document smolt-to-adult survival and develop goal | ---- | 4h |
| Follow IHOT requirements for checking water flow alarms daily | ---- | 6 |
| Conduct IHOT QA/QC tests for feed preparation | ---- | 12 |
| Develop specific incubation and rearing standards for the IHOT Operations Plan | ---- | 18-19 |
| Develop smoltification goal and monitor | ---- | 22a1 |
| Conduct fishery contribution studies | ---- | 24 |
| Develop approved genetics M&E plan | ---- | 43 |
| Type 3 – Remedial actions requiring changes in monitoring coverage or interval | | |
| Monitor and record DO and TGP | ---- | 5b |
| Run analysis for water chemistry parameters, turbidity, alkalinity, hardness, nitrite, and contaminants | ---- | 5c-5g |

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

| Remedial Action Required | Cost | PMS ¹ |
|---|---------------|----------------------|
| Type 4 - Remedial actions requiring significant capital expenditures | | |
| Develop 450 gpm for pathogen-free water for incubation and early rearing | \$300,000 | 4d, 5a, 19, 22a4, 28 |
| Install telephone pagers | \$5,000 | 6 |
| Construct new screens to meet approach velocity, screen mesh criteria, and active bypass | \$500,000 | 10 |
| Provide bird netting on exterior raceways | \$45,000 | 11 |
| Construct volitional release system | \$100,000 | 13 |
| Provide acclimation sites for fish not released in hatchery subbasin | \$5.0 million | 22b, 22c |
| 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 Skamania Hatchery - Summer Steelhead

| Remedial Action Required | Cost | PMS ² |
|--|------|------------------|
| 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 | | |
| Develop hatchery monitoring and evaluation plan | ---- | 3 |
| Document adult contribution | ---- | 4a |
| Develop pre-spawning survival goal for IHOT Operations Plan | ---- | 4b |
| Document smolt-to-adult survival and develop goal | ---- | 4h |
| Follow IHOT requirements for checking water flow alarms daily | ---- | 6 |

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 |
|---|-------------|------------------------|
| Conduct IHOT QA/QC tests for feed preparation | ---- | 12 |
| Develop specific incubation and rearing standards for the IHOT Operations Plan | ---- | 18-19 |
| Develop smoltification goal and monitor | ---- | 22a1 |
| Conduct fishery contribution studies | ---- | 24 |
| Develop approved genetics M&E plan | ---- | 43 |
| Type 3 - Remedial actions requiring changes in monitoring coverage or interval | | |
| Monitor and record DO and TGP | ---- | 5b |
| Run analysis for water chemistry parameters, turbidity, alkalinity, hardness, nitrite, and contaminants | ---- | 5c-5g |

| Remedial Action Required | Cost | PMS¹ |
|---|---------------|------------------------|
| Type 4 - Remedial actions requiring significant capital expenditures | | |
| Develop 450 gpm for pathogen-free water for incubation and early rearing | \$300,000 | 4f, 5a, 5h, 19, 28 |
| Install telephone pagers | \$5,000 | 6 |
| Construct new screens to meet approach velocity, screen mesh criteria, and active bypass | \$500,000 | 10 |
| Provide bird netting on exterior raceways (30,000 sf) | \$45,000 | 11 |
| Construct volitional release system | \$100,000 | 13 |
| Provide acclimation sites for fish not released in hatchery subbasin | \$4.1 million | 22b, 22c |
| Type 5 - Remedial actions that may require significant capital expenditures but are not clearly definable at this time | | |
| None | ---- | |

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

| Remedial Action Required | Cost | PMS² |
|--|-------------|------------------------|
| Type 1 - Non-compliance issues resulting from items beyond human control or Performance Measures not relevant for this hatchery | | |
| Increase adult returns | | 4g, 22a4, 41 |
| Install security alarms | ---- | 6 |
| Type 2 - Remedial actions requiring changes in agency policies or procedures | | |
| Develop hatchery monitoring and evaluation plan | ---- | 3 |
| Document adult contribution | ---- | 4a |
| Develop pre-spawning survival goal for IHOT Operations Plan | ---- | 4b |
| Revise green-egg to eyed-egg survival goal for IHOT Operations Plan | | 4d |

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 |
|--|-------------|------------------------|
| Document smolt-to-adult survival and develop goal | ---- | 4h |
| Follow IHOT requirements for checking water flow alarms daily | ---- | 6 |
| Develop adult holding criteria for IHOT | ---- | 7 |
| Conduct IHOT QA/QC tests for feed preparation | ---- | 12 |
| Develop specific incubation and rearing standards for the IHOT Operations Plan | ---- | 18-19 |
| Develop smoltification goal and monitor | ---- | 22a1 |
| Conduct fishery contribution studies | ---- | 24 |
| Develop approved genetics M&E plan | ---- | 43 |

| Remedial Action Required | Cost | PMs¹ |
|---|-------------|------------------------|
| Type 3 - Remedial actions requiring changes in monitoring coverage or interval | | |
| Monitor and record DO and TGP | ---- | 5b |
| Run analysis for water chemistry parameters, turbidity, alkalinity, hardness, nitrite, and contaminants | ---- | 5c-5g |
| Type 4 - Remedial actions requiring significant capital expenditures | | |
| Develop 450 gpm for pathogen-free water for incubation and early rearing | \$300,000 | 5a, 5h, 19, 28 |
| Install telephone pagers | \$5,000 | 6 |
| Construct new screens to meet approach velocity, screen mesh criteria, and active bypass | \$500,000 | 10 |
| Provide bird netting on exterior raceways | \$45,000 | 11 |
| Construct volitional release system | \$100,000 | 13 |
| Provide acclimation sites for fish released in four subbasins | 5.0 million | 22b, 22c |
| 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.

Hatchery Contribution to Fisheries, Spawning Grounds, and Hatcheries

This section presents the audit findings for the Skamania Hatchery - Winter Steelhead, Summer Steelhead, and Sea-run Cutthroat Trout programs contribution of adult fish to fisheries, local fisheries, spawning grounds, and hatcheries (Tables 4a, 4b, and 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:
Skamania Hatchery - Winter 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 | Complete information not provided | Complete information not provided | Complete information not provided | Complete information not provided | Complete information not provided |
| 1988 | Complete information not provided | Complete information not provided | Complete information not provided | Complete information not provided | Complete information not provided |
| 1989 | Complete information not provided | Complete information not provided | Complete information not provided | Complete information not provided | Complete information not provided |
| 1990 | Complete information not provided | Complete information not provided | Complete information not provided | Complete information not provided | Complete information not provided |
| 1991 | | | | | |
| 1992 | | | | | |

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

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

**Table 4b. Adult Contribution to Fisheries, Spawning Grounds, and Hatcheries:
Skamania Hatchery - Summer Steelhead**

| Year | Fisheries¹ (Broodyear) | Spawning Grounds¹ (Broodyear) | Hatchery¹ (Broodyear) | Total Combined Contribution² (Broodyear) | Smolt to Adult Survival (percent) |
|-------------|--|---|---|--|--|
| 1984 | | | | | |
| 1985 | | | | | |
| 1986 | | | | | |
| 1987 | Complete information not provided | Complete information not provided | Complete information not provided | Complete information not provided | Complete information not provided |
| 1988 | Complete information not provided | Complete information not provided | Complete information not provided | Complete information not provided | Complete information not provided |
| 1989 | Complete information not provided | Complete information not provided | Complete information not provided | Complete information not provided | Complete information not provided |
| 1990 | Complete information not provided | Complete information not provided | Complete information not provided | Complete information not provided | Complete information not provided |
| 1991 | | | | | |
| 1992 | | | | | |

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

| 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 | Complete information not provided | Complete information not provided | Complete information not provided | Complete information not provided | Complete information not provided |
| 1988 | Complete information not provided | Complete information not provided | Complete information not provided | Complete information not provided | Complete information not provided |
| 1989 | Complete information not provided | Complete information not provided | Complete information not provided | Complete information not provided | Complete information not provided |
| 1990 | Complete information not provided | Complete information not provided | Complete information not provided | Complete information not provided | Complete information not provided |
| 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, 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 Skamania 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 6. Annual Operating Expenses - Skamania Hatchery

| Program | 1994 | 1995 | 1996 |
|-----------------------------|------------------|------------------|------------------|
| 1. Winter Steelhead | \$169,733 | \$164,557 | \$172,871 |
| 2. Summer Steelhead | \$192,389 | \$174,015 | \$161,794 |
| 3. Sea-run Cutthroat | \$9,397 | \$39,456 | \$61,316 |
| 4. | | | |
| 5. | | | |
| Total Hatchery Costs | \$371,408 | \$378,293 | \$395,585 |

Table 6a. Detailed Expenditures at Skamania Hatchery by Program

Winter Steelhead

| Component | 1994 | 1995 | 1996 |
|------------------------------------|------------------|------------------|------------------|
| Personnel Costs | \$127,403 | \$130,212 | \$135,600 |
| Operational Costs | \$130,460 | \$130,080 | \$139,640 |
| Capital Costs | \$95,000 | \$95,000 | \$95,000 |
| Indirect Costs | \$81,878 | \$86,335 | \$88,678 |
| Lumped Hatchery Costs ¹ | | | |
| Lumped Third-Party Costs | | | |
| Total Hatchery Costs | \$371,408 | \$378,293 | \$395,585 |
| Source of Funds | | | |
| NMFS | 100% | 100% | 100% |
| | | | |
| Program Production (lb) | 50,247 | 39,132 | 52,330 |
| Total Production (lb) | 109,943 | 89,858 | 119,812 |
| Program as Percent of Total | 45.7a% | 43.5% | 43.7% |
| Program Costs | \$169,733 | \$164,557 | \$172,871 |

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 Skamania Hatchery by Program

Summer Steelhead

| Component | 1994 | 1995 | 1996 |
|------------------------------------|------------------|------------------|------------------|
| Personnel Costs | \$127,403 | \$130,212 | \$135,600 |
| Operational Costs | \$130,460 | \$130,080 | \$139,640 |
| Capital Costs | \$95,000 | \$95,000 | \$95,000 |
| Indirect Costs | \$81,878 | \$86,335 | \$88,678 |
| Lumped Hatchery Costs ¹ | | | |
| Lumped Third-Party Costs | | | |
| Total Hatchery Costs | \$371,408 | \$378,293 | \$395,585 |
| Source of Funds | | | |
| NMFS | 100% | 100% | 100% |
| | | | |
| Program Production (lb) | 56,913 | 41,351 | 48,949 |
| Total Production (lb) | 109,943 | 89,858 | 119,812 |
| Program as Percent of Total | 51.8% | 46.0% | 40.9% |
| Program Costs | \$192,389 | \$174,015 | \$161,794 |

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 Skamania Hatchery by Program

Sea-run Cutthroat

| Component | 1994 | 1995 | 1996 |
|------------------------------------|------------------|------------------|------------------|
| Personnel Costs | \$127,403 | \$130,212 | \$135,600 |
| Operational Costs | \$130,460 | \$130,080 | \$139,640 |
| Capital Costs | \$95,000 | \$95,000 | \$95,000 |
| Indirect Costs | \$81,878 | \$86,335 | \$88,678 |
| Lumped Hatchery Costs ¹ | | | |
| Lumped Third-Party Costs | | | |
| Total Hatchery Costs | \$371,408 | \$378,293 | \$395,585 |
| Source of Funds | | | |
| NMFS | 100% | 100% | 100% |
| | | | |
| Program Production (lb) | 27,83 | 9,375 | 18,533 |
| Total Production (lb) | 109,943 | 89,858 | 119,812 |
| Program as Percent of Total | 2.53% | 10.43% | 15.5% |
| Program Costs | \$9,397 | \$39,456 | \$61,316 |

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